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COP29 and South Sudan

Climate change, oil pollution and birth defects

Plus

- Modern contraceptives use among women in Terekeka County
- Liver fibrosis among people with hepatitis B in rural Uganda
- Validity of semi-structured questionnaire for hepatitis B virus infections
- A five-year epidemiological study of tuberculosis in Algeria
- Improvised explosive device injuries to the maxillofacial region
- Attitudes towards digital mental health in Sudan
- Understanding the risks of kissing infants
- A review of one year malaria blood film data

- **Basic statistical methods**
- **Simple sample size calculations**
- **How to author a research proposal**
- **Quantitative and qualitative approaches**
- **Determinants of success in health research**

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South Sudan Medical Journal
Juba, South Sudan

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FRONT COVER IMAGE: An aerial assessment from Gumuruk to Lekongole, shows people in canoes and their completely submerged tukuls in 2020 (Credit MSF)

BACKCOVER ADVERT: The South Sudan Medical Journal is looking for volunteers to join its Editorial team

Climate change, oil pollution, and birth defects in South Sudan: A growing crisis

Edward Eremugo Kenyi
Editor-in-Chief
South Sudan Medical Journal

Correspondence:
Southsudanmedicaljournal@gmail.com

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As global leaders, organizations, and activists meet in Baku, Azerbaijan, for the 29th session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP29), the communities of Unity State in South Sudan know what climate change means. The people of this region find themselves trapped in a vicious cycle of environmental destruction, human suffering, and a growing public health disaster.

We have previously covered the devastating effects of the floods in the region.[1] These floods happen every rainy season but tend to recede as the dry season approaches. However, since 2020, the flood waters have stayed permanent in some areas. The following season tends to add more water to an already soaked soil, causing devastating suffering to the population. According to the recent BBC documentary, "at the worst point in 2022, two-thirds of Unity State was submerged; it says about 40% is still under water."[2]

These floods aggravate an already bad situation in this oil-producing region. South Sudan is rich in oil resources, and oil extraction has been central to the country's economy since it gained independence from Sudan in 2011. However, it inherited an oil industry mired in corruption and environmental neglect. As per the reports, long-term oil spills and pollution are causing devastating effects in the communities.[2] The toxic chemicals from oil production and pollution have entered the drinking water of the communities and their cattle.

Some reports found "increased salinity and high concentrations of heavy metals in water nearer oil wells, as well as high concentrations of lead and barium in human hair samples." These contaminations have been blamed for the increased number of children born with birth defects.[2,3,4] Since 2013, the accounts of babies born with deformities in the areas have been submitted to the government, which then commissioned an environmental audit of the oil industry's effects in the region, but the final report was not released.[5] Koch County Hospital alone reported 15 cases of babies born with deformities since 2019, and all have died.[3] The Ministry of Health said they are working with the Ministry of Environment to investigate the reports.

The recent BBC documentary quoted Dr Nicole Deziel, an environmental health specialist at Yale University: "It is plausible that oil-related pollution could contribute to an increased risk of birth defects." She added that "some compounds released during the production of oil can affect foetal development."[2]

The World Health Organization (WHO) defines birth defects as "structural or functional anomalies (for example, metabolic disorders) that occur during intrauterine life and can be identified prenatally, at birth, or sometimes may only be detected later in infancy, such as hearing defects. Broadly, congenital refers to the existence at or before birth."[5] According to the WHO, "while complex

genetic and environmental interactions are proposed, most congenital disorders have unknown causes, including congenital heart defects, cleft lip or palate and club foot."[6]

The struggle with climate change, oil pollution, and birth defects is a real, complex, and tragic issue that requires immediate and coordinated action from both government and other organizations.

A concerted effort must be made to clean up oil pollution and hold companies responsible for environmental damage accountable. International oil companies operating in South Sudan should be required to adopt cleaner technologies and engage in full transparency regarding their environmental practices. South Sudan's government must also work with global organizations to strengthen environmental regulations, ensure the safety of water and food supplies, and protect the health of the population.

The expectant mothers and children deserve a future free from the deadly consequences of climate change, environmental degradation, and pollution.

We urge the South Sudan government to release the environmental audit report so that the recommendations can be implemented, with more oversight of the oil companies. A systematic study should be done to collect data and determine the exact relationship between oil pollution and the rise in birth defects.

Investment in healthcare infrastructure must be made in these affected regions. With a strong commitment to building local healthcare systems and improving access to care for vulnerable populations, South Sudan can begin to mitigate the long-term consequences of these crises.

Whatever the resolutions of the COP29 may be, the affected communities in Unity State, especially the expectant mothers and children, deserve a future free from the deadly consequences of climate change, environmental degradation, and pollution.

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Modern contraceptives use among women in Terekeka County, Central Equatoria State, South Sudan

Imba Alex David[1], Ambayo Peter Otte[2], Mawa Ratib[3] and Lou Eluzai Loponi[4]

Authors Affiliations:
1. Uganda Christian University, Uganda.
2. Liverpool School of Tropical Medicine, UK.
3. Victoria University, Kampala, Uganda.
4. Texila American University, Guyana, Central America.

Correspondence:
Imba Alex David
imbaalex1@gmail.com

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ABSTRACT

Introduction: The South Sudan health sector strategic plan indicates that only 1.2% of women aged 15-49 years have their need for family planning met, and the contraceptive prevalence rate of 6% is lower than the rate of 17% in the whole of sub-Saharan Africa. The use of modern contraceptives contributes to women's health and reduces maternal mortality related to pregnancy and childbirth complications globally. The study investigated the utilization of modern contraceptives among women of reproductive age (WRA) in Terekeka County of South Sudan.

Method: We employed cross-sectional, qualitative, and quantitative research involving in-depth interviews with key informants. Respondents were selected purposively and through a multistage random sampling technique. Data were analysed using thematic content analysis.

Results: There were 384 respondents. The results indicate that 21.4% of the women use modern contraceptives. Demographic factors such as education, religion, marital status, knowledge, access to contraceptive information, and partner support are positively associated with the use of modern contraceptives in Terekeka County.

Conclusion: We conclude that if all WRA had access to education and family planning information, many would use modern contraceptives. The study recommends more studies to explore the use of modern contraceptives in the whole country.

Keywords: Modern contraceptives, contraceptive use, women of reproductive age, family planning, South Sudan

Introduction

To measure progress towards Sustainable Development Goals (SDG 3.7), we need to know the extent of both modern contraceptive use and the unmet need for family planning: "By 2030, ensure universal access to sexual and reproductive healthcare services, including for family planning, information and education,

and the integration of reproductive health into national strategies and programs." [1] According to the World Health Organization,[2] globally, only 842 million women of reproductive age used contraceptives, but 270 million had an unmet need for contraception, and 1.1 billion needed family planning compared to the 1.9 billion population.[2]

The prevalence of modern contraceptive use among married women of reproductive age (MWRA) has increased worldwide between 2000 and 2019 by 2.1 percentage points from 55.0% to 57.1%, but this is below the SDG target of 75.7%.[3]

The prevalence of modern contraceptive use ranges from 7% in the Gambia to 29% in Uganda, and aspects of the issues vary substantially across countries.[4] A study conducted in Uganda revealed that most women (99%) had knowledge of contraceptive use compared to about 40% uptake.[5]

According to a 2017 report in Warap State, South Sudan, only 1.2% of WRA were using family planning methods.[6] According to the South Sudan FP2030 indicator summary sheet for modern contraceptive use, modern contraceptive use was 3.4% in 2018, 3.6% in 2019, and 3.7% in 2020.[7] South Sudan has some of the worst social indicators globally, particularly for women and girls; for example, the maternal mortality ratio is estimated at 1,150 per 100,000 live births. Most of these deaths are preventable through the provision of essential maternal health commodities, such as contraceptives and essential medicines.[8] However, Terekeka County has limited information on modern contraceptive utilization. Therefore, this study aimed to bridge the knowledge gap to provide better family planning services.

Method

This was a descriptive cross-sectional study that employed both quantitative and qualitative data collection methods to determine modern contraceptive utilization among WRA (15-49 years) in Terekeka County. The data were collected from August to September 2021.

The study used multistage systematic random selection – where selection started at County, Payam, Boma, village, and finally, household levels, respectively, for quantitative data. The data were collected from 384 women of reproductive age at their homes in rural and semi-urban areas using a structured questionnaire. Purposive sampling was used to collect qualitative data through ten focused group discussions with women who did not participate in the structured questionnaire interviews and six key informant interviews with the health facility and the midwife in charge. Cochrane's formula was used to calculate the sample of 384 for a large population and an unknown proportion using modern contraception.

To ensure the quality of the data, competent research assistants and supervisors were recruited and trained, and study tools were translated into the local Bari language and tested before data collection. Focused group discussions were tape-recorded, and the research team was under daily supervision, in addition to the researcher's collection and storage of completed tools.

Prior approval of the study was obtained from the Research Ethics Committee (REC) of Uganda Christian University (UCU) and the Ministry of Health Research Ethics Review Board (MOH-RERB), South Sudan. Informed consent was sought from the respondents before administering the study tools.

Data analysis was done using IBM SPSS Statistics version 23.0. Chi-squared tests and logistic regression were used to analyse the quantitative data, while thematic content analysis was used for qualitative data. The significance level was set to 95%.

Results

The socio-demographic characteristics of the sample, and use of modern contraceptives are shown in table 1. Overall, 21.4% of respondents used modern contraception (CI 17.5 - 25.7).

Chi-squared tests showed that the factors associated with modern contraceptive utilization were the age of the partner (p-value=0.018), education level of women (p-value <0.001) and partner's education level (p-value <0.001), occupation of women (p-value <0.001), partners occupation (p-value <0.001) and religion of women (p-value=0.02).

Table 2 shows the results of unadjusted and adjusted logistic regression analysis. The adjusted analysis showed that only women's education was a significant factor. Women who had either primary (AOR 2.86, CI 1.32 – 6.22) or secondary/college/university (AOR= 8.68, CI: 3.22-23.42) education had higher odds of using modern contraception.

However, some key informants had a different perception, for example:

Table 1: Socio-demographic characteristics of sample and modern contraceptive use (N=384)

		Percentage n (%)	User n (%)	Non-user n (%)	p-value
Women age (years)	15 - 24	125 (32.6)	26 (20.8)	99 (79.2)	0.120
	25 - 30	133 (34.6)	27 (20.3)	106 (79.7)	
	31 - 35	51 (13.3)	17 (33.3)	34 (66.7)	
	36 - 49	75 (19.5)	12 (16.0)	63 (84.0)	
Partners age (Years)	20-29	41 (13.1)	11 (26.8)	30 (73.2)	0.018
	30 -34	64 (20.5)	14 (21.9)	50 (78.1)	
	35 - 39	70 (22.4)	12 (17.1)	58 (82.9)	
	40 - 44	65 (21.0)	22 (33.8)	43 (66.2)	
	45 - 62	72 (23.1)	08 (11.1)	64 (88.9)	
Marital status	Single	83 (21.6)	19 (22.9)	64 (77.1)	0.700
	Married	301 (78.4)	63 (20.9)	238 (79.1)	
Woman's education	None	232 (60.4)	23 (09.9)	209 (90.1)	<0.001
	Primary	80 (20.8)	25 (31.3)	55 (68.8)	
	Secondary or above	72 (18.8)	34 (47.2)	38 (52.8)	
Partner's education	None	190 (60.9)	18 (09.5)	172 (90.5)	<0.001
	Primary	45 (14.4)	08 (17.8)	37 (82.2)	
	Secondary or above	77 (24.7)	41 (53.2)	36 (46.8)	
Woman's occupation	Peasant/small scale business	351 (91.4)	65 (18.5)	286 (81.5)	<0.001
	Formal employment	33 (8.6)	17 (51.5)	16 (48.5)	
Partner's occupation	Peasant/small scale business	248 (79.5)	34 (13.7)	214 (86.3)	<0.001
	Formal employment	64 (20.5)	33 (51.6)	31 (48.4)	
Family income (SSP)	0 – 2500	126 (32.8)	18 (14.3)	108 (85.7)	0.090
	2501 – 5000	75 (19.5)	17 (22.7)	58 (77.3)	
	5001 – 10,000	54 (14.1)	12 (22.2)	42 (77.8)	
	10001 & above	129 (33.6)	35 (27.1)	94 (72.9)	
Religion	Catholic	268 (69.8)	50 (18.7)	218 (81.3)	0.020
	Protestant	98 (25.5)	24 (24.5)	74 (75.5)	
	Muslim	18 (4.7)	08 (44.4)	10 (55.6)	
Ethnicity	Mundari	347 (90.4)	72 (20.7)	275 (79.3)	0.340
	Others	37 (9.6)	10 (27.0)	27 (73.0)	
Number of children alive	0	78 (20.3)	14 (17.9)	64 (82.1)	0.660
	1 – 5	210 (54.7)	48 (22.9)	162 (77.1)	
	6 – 12	96 (25.0)	20 (20.8)	76 (79.2)	
Total		**384 (100)**	**82 (21.4)**	**302 (78.6)**	

Seventy-two respondents did not answer partners' age, education, and occupation questions.

Table 2: Logistic regression exploring the relationship between socio-demographic characteristics and use of modern contraceptives.

		COR (95% CI)	AOR (95% CI)
Age of women (years)	15 – 24	1.00	1.00
	25 – 30	0.97 (0.53 – 1.78)	0.56 (0.23 – 1.40)
	31 – 35	1.90 (0.92 – 3.93)	1,26 (0.40 – 3.92)
	36 – 49	0.72 (0.34 – 1.54)	0.47 (0.14 – 3.33)
Marital status	Single/divorced/widow	1.00	1.00
	Married	0.89 (0.50 – 1.60)	0.68 (0.09 – 2.95)
Education Level of woman	None	1.00	1.00
	Primary	4.13 (2.18 – 7.83)	2.86 (1.32 – 6.22) *
	Second-ary/College/University	8.13 (4.32 – 15.29)	8.68 (3.22 – 23.42) *
Occupation of woman	Peasant/small scale business	1.00	1.00
	Formal employment	4.68 (2.24 – 9.74)	1.85 (0.65 – 5.22)
Family income (SSP)	0 – 2500	1.00	1.00
	2501 – 5000	1.76 (0.84 – 3.67)	2.05 (0.79 – 5.30)
	5001 – 10000	1.71 (0.76 – 3.86)	1.20 (0.43 – 3.35)
	10001 & above	2.23 (1.19 – 4.20)	1.60 (0.68 – 3.73)
Religion	Catholic	1.00	1.00
	Protestant	1.41 (0.81 – 2.46)	1.12 (0.55 – 2.26)
	Muslim	3.49 (1.31 – 9.29)	2.48 (0.63 – 9.72)
Number of live children	0	1.00	1.00
	1 – 5	1.35 (0.69 – 2.63)	4.55 (0.72 – 28.81) *
	6 – 12	1.20 (0.56 – 2.57)	5.36 (0.66 – 43.79) *

Seventy-two respondents did not answer partners' age, education, and occupation questions.

"... In this community, the age of the partner of the women influences the utilization of modern contraceptive" (In-charge of the Primary Health Centre).

Knowledge of, access to, and use of modern contraceptives amongst the sample are shown in Table 3.

Attendees at private health facilities were more likely to use modern contraception (p-value= 0.004). Other significant factors were the cost of modern contraceptives (p-value <0.001), safety on the road (p-value <0.001), waiting time at health facilities (p-value <0.001), waiting time fair (p-value <0.001), husband support for modern contraceptives (p-value <0.001) and type of support provided by husband (p-value <0.001).

Table 4 shows the results of unadjusted and adjusted logistic regression analysis. Women who felt safe/secure on the road were more likely to use modern contraception (AOR=2.76, CI: 1.10-6.98), as were women who waited for less than 30 minutes at health facility (AOR=6.80, CI: 2.41-19.15) and those who waited nearly an hour (AOR=5.31, CI: 2.14-13.17).

Comments from the qualitative analysis included:

...Some women and men in this community believe that implants can move to other parts of the body. As a result, the woman will not get pregnant anymore, and it is being witch/wizard when you use modern contraceptives" (Midwife Primary Health Care Centre).

Table 3: Knowledge of, access to, and use of modern contraceptives (N=384)

		Percentage n (%)	User n (%)	Non-user n (%)	p-value
Heard about modern contraceptives	Yes	256 (66.7)	71 (27.7)	185 (72.3)	<0.001
	No	128 (33.3)	0 (0.0)	128 (100.0)	
Sources of information	Health facility	199 (77.7)	52 (26.1)	147 (73.9)	0.440
	/Relatives/ Radio/TV/News papers	57 (22.3)	12 (21.1)	45 (78.9)	
Why are modern contraceptives good?	Healthy children	113 (49.1)	38 (33.6)	75 (66.4)	0.810
	Healthy mothers	65 (28.3)	20 (30.8)	45 (69.2)	
	Saves Family incomes	52 (22.6)	15 (28.8)	37 (71.2)	
Health facilities with modern contraceptives	Yes	259 (67.4)	71 (27.4)	188 (72.6)	<0.001
	No	125 (32.6)	11 (8.8)	114 (91.2)	
Type of health facili-ies	Public PHCCs/PHUs	296 (92.5)	70 (23.6)	226 (76.4)	0.004
	Private health facilities	24 (7.5)	12 (50.0)	12 (50.0)	
Cost of modern contraceptives (South Sudanese Pound)?	No payment	285 (74.2)	63 (22.1)	222 (77.9)	<0.001
	500 or less	81 (21.1)	8 (9.9)	73 (90.1)	
	Above 500	18 (4.7)	11 (61.1)	7 (38.9)	
Cost affects modern contraceptives use	Yes	87 (22.7)	18 (20.7)	69 (78.3)	0.860
	No	297 (77.3)	64 (21.5)	233 (78.5)	
Distance to health facility (Km)	3 & above	60 (16.7)	13 (21.7)	47 (78.3)	0.860
	1 - 2	177 (49.2)	40 (22.6)	137 (77.4)	
	Less than 1	123 (34.1)	25 (20.3)	98 (79.7)	
Distance affects modern contraceptives use	Yes	126 (32.8)	24 (19.0)	102 (81.0)	0.440
	No	258 (67.2)	58 (22.5)	200 (77.5)	
Safe to travel to health facilities	Safe	240 (62.5)	68 (28.3)	172 (71.7)	<0.001
	Unsafe	144 (37.5)	14 (9.7)	130 (90.3)	
Waiting time for modern contraceptives	1 hour & above	164 (42.7)	18 (11.0)	146 (89.0)	<0.001
	30 minutes to 1 hour	121 (31.5)	31 (25.6)	90 (74.4)	
	Less than 30 minutes	99 (25.8)	33 (33.3)	66 (66.7)	
Waiting time at health facilities fair	Yes	150 (39.1)	50 (33.3)	100 (66.7)	<0.001
	No	234 (60.9)	32 (13.7)	202 (86.3)	
Husband support use of modern contraceptives	Yes	136 (43.6)	45 (33.1)	91 (66.9)	<0.001
	No	176 (56.4)	22 (12.5)	154 (87.5)	
Type of support	Escort wife to FP clinic	26 (19.1)	8 (30.80)	18 (69.20)	<0.001
	Approve/Decide use of Modern Contraceptives	39 (28.7)	22 (56.40)	17 (43.60)	
	Financial support	71 (52.2)	15 (21.10)	56 (78.90)	
Total		**384 (100)**	**82 (21.4)**	**302 (78.6)**	

Notes on the table above: Not all questions were relevant to all respondents: 128 respondents did not answer source of information, 154 did not answer why modern contraceptives good, 64 did not answer types of health facilities, 24 did not answer distance to health facilities, 72 did not answer husband's support, and 248 did not answer type of husband's support.

Table 3: Knowledge of, access to, and use of modern contraceptives (N=384)

		COR (95% CI)	AOR (95% CI)
Heard about modern contraceptives	No	1.00	1.00
	Yes	4.08 (2.08 – 8.02)	3.70 (1.43 – 9.61) *
Health facility with modern contraceptives	No	1.00	1.00
	Yes	3.91 (1.99 – 7.69)	2.86 (1.11 – 7.39) *
Payment for modern contraceptives	Yes	1.00	1.00
	No	1.19 (0.67 – 2.12)	0.68 (0.28 – 1.66)
Distance to health facility (Km)	3 & above	1.00	1.00
	1 – 2	1.15 (0.61 – 2.18)	0.47 (0.19 – 1.21)
	Less than 1	1.01 (0.50 – 2.01)	0.22 (0.07 – 0.66)
Safety on road to health facilities	Unsafe	1.00	1.00
	Safe	3.67 (1.98 – 6.82)	2.76 (1.10 – 6.98) *
Waiting time for modern contraceptives (hours)	1 hour & above	1.00	1.00
	30 minutes > 1 hr	2.79 (1.47 -5.28)	5.31 (2.14 – 13.17) *
	Less than 30 minutes	4.05 (2.13 – 7.72)	6.80 (2.41 – 19.15) *

** Statistically significant results.*

"*... The modern contraceptives we provide include injectables, pills, implants, and condoms*" (In-charge Primary Health Care Centre).

"*...Modern contraceptives help in child spacing or prevent unwanted pregnancy and me as the mother of the child will be healthy*" (Woman Tali Payam Focused group discussion).

"*...My husband does not want me to use modern contraceptives; he said I will not get pregnant again when I use modern contraceptives, and I must respect him to avoid fighting at home*" (Woman Muni Payam Focused group discussion).

Discussion

The age of the partner was associated with modern contraceptive utilization, and this is because older men can make informed decisions, though this finding is not in line with a study in Ethiopia[9] where the age of the partner never had a positive relationship with modern contraceptive utilization. The study also revealed that couples who are educated are more likely to use modern contraceptives because they know their importance, and this study agrees with the study in Juba City.[10] A study in Ethiopia[9] revealed that the occupation of women and their partners was associated with modern contraceptive utilization. In Nigeria, socioeconomic status has a significant influence on modern contraceptive utilization.[11] Another study in Nigeria also revealed that being Muslim (religion) was statistically significant to the utilization of modern contraceptives, and the authors stated that it was because women who are Muslim have fewer misconceptions about modern contraceptives.[12] A further study in Nigeria indicates that women with many children were more likely to use modern contraceptives.[13]

In Nepal, only 21% of women were using modern contraceptives due to a lack of media exposure.[14] Again, a study conducted in Nigeria revealed that the effect of

awareness of family planning methods on the increased use of modern contraceptives was significant.[11] Likewise, in Indonesia, a study indicated that access to health services and free services had a positive relationship with modern contraceptive utilization.[15]

Conclusion

The study concluded that level of education, occupation, religion (Muslim) and having many children, knowledge about modern contraceptives, access, and partner's support were positively associated with modern contraceptive utilization while age, marital status, and traditional healers were not. Finally, modern contraceptive utilization was higher than the national prevalence.

We recommend increasing awareness of contraception, encouraging partners' support, and researching why Terekeka County has a higher prevalence of modern contraceptives.

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South Sudan floods: the first example of a mass population permanently displaced by climate change?

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Liz Stephens, Professor of Climate Risks and Resilience, University of Reading and Jacob Levi, Institute of International Health, Charité – Berlin University of Medicine

Enormous floods have once again engulfed much of South Sudan, as record water-levels in Lake Victoria flow downstream through the Nile. More than 700,000 people have been affected. Hundreds of thousands of people there were already forced from their homes by huge floods a few years ago and were yet to return before this new threat emerged.

Now, there are concerns that these displaced communities may never be able to return to their lands. While weather extremes regularly displace whole communities in other parts of the world, this could be the first permanent mass displacement due to climate change.

…. In the Sudd region of South Sudan, the Nile passes through a vast network of smaller rivers, swamps and floodplains. It's one of the world's largest wetlands. Flood levels vary significantly from year to year, mostly caused by fluctuations in water levels in Lake Victoria and controlled releases from the dam in Uganda where the lake empties into the Nile.

Read the full article at: https://theconversation.com/south-sudan-floods-the-first-example-of-a-mass-population-permanently-displaced-by-climate-change-238461

Validity of semi-structured questionnaire for prevalence and risk factors of hepatitis B virus infections among women of reproductive age

Ezbon WApary[1], Akway M. Cham[1] and Oromo F. Seriano[2]

Authors Affiliations:
1. Department of Community Medicine, School of Medicine, University of Juba, South Sudan
2. Department of Pathology, School of Medicine, University of Juba, South Sudan

Correspondence:
Ezbon WApary
w.apary@gmail.com

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ABSTRACT

Introduction: Hepatitis B is a viral disease caused by the hepatitis B virus (HBV). This virus increasingly infects the population each year. The evidence focusing on the validity of a research tool in the South Sudan context is scant. This study examined the validity of the questionnaire for prevalence and risk factors of HBV infection among women of reproductive age in South Sudan.

Method: The study adapted a quantitative cross-sectional research design. Nine panelists were selected. Twenty-nine items of two key constructs, demographic characteristics and health behaviours, were assessed and analysed using formula 1 (Lawshe's Content Validity Ratio) and formula 2 (Lawshe's Content Validity Index) built-in Power Pivot of Microsoft Office 365.

Results: Twenty-nine questions of the constructs surpassed the content validity ratio threshold value of 0.78. Thus, we maintained these questions in the final semi-structured questionnaire. The demographic characteristic construct's overall content validity index (CVI) was 0.926, and the health behaviour construct was 0.928.

Conclusion: This study validated the semi-structured questionnaire for assessing the prevalence and risk factors of HBV infection among women of reproductive age in South Sudan. This tool identified the essential items in this health domain. Therefore, it should assist researchers in collecting data related to hepatitis B.

Keywords: hepatitis B virus, semi-structured questionnaire, validity, women of reproductive age

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Introduction

Hepatitis B is a communicable viral infection that transmits from one person to others as may occur at the time of sexual contact. Sharp tools that have become contaminated with the virus pose a risk of transmission. Whereas a first infection with HBV is considered acute, a persistent infection lasting more than six months is a chronic infection. An HBV transmission from mother to child during birth and delivery is called a vertical transmission. Horizontal transmission refers to the

Table 1. Number of research participants

Panellist Code	Filed of Expertise
E1	Public Health
E2	Pathology
E3	Epidemiology
E4	Health Systems and Management
E5	Infectious Diseases
E6	Public Health
E7	Health Policies, Planning & Financing
E8	Public Health
E9	Obstetrics and Gynaecology

passage from one host to another (e.g., exposure to or ingestion of infective material). In Africa, 82.3 million live with HBV, and at least 200,000 die each year.[1,2] South Sudan is not an exception among the African countries. The country has been subjected to conflicts that have weakened the health system and the people's health status, particularly the women and children.[3,4] The fragmented social structures exacerbate the transmission of HBV. Cultural patterns promote HBV transmission, e.g., inadequately sterilised tools used in ear piercing and tribal markings and eating together from common utensils.[5]

Importantly, the research instruments refer to the set of key questions and probes that researchers use to gather data of interest.[6] While diverse research tools exist, the semi-structured questionnaire is vital in collecting data related to HBV infection. The tool normally constitutes two sections. The section A consists of various questions related to the demographic characteristics of the study participants. The section B comprises questions relevant to HBV infection and risk factors among women of reproductive age. The questions emerged from the previous studies.[5,7,8]

Reliability and validity are key for any questionnaire. Reliability assesses internal consistency and the stability of the measures, whereas validity examines the extent to which the tool is intended to measure. The basis of validating the interview guide is to minimise errors in the application process.[9] Lawshe's Content Validity Ratio (CVR) analysis method has been widely used in content validity tests. The credibility of an instrument, whether developed or adapted, depends on its validity and reliability.[6] Additionally, the evidence focusing on the validity of the semi-structured questionnaire in South Sudan is limited. Consequently,

Table 2. Main constructs and list of the items

Main Construct and its items	Number of Items
Demographic Characteristics	**12**
Name of health facility	
How old are you: age (in years)?	
What is your residential area in Juba City?	
What is your state or administrative area of origin in South Sudan?	
What is your religion?	
What is your highest level of Education?	
What is your occupation?	
What is your employment status?	
What is your marital status?	
Type of marriage	
Parity: How many children have you ever delivered alive?	
What is your family income per month in South Sudan pounds?	
Health behaviours	**17**
When you have manicure or pedicure, what instrument is used?	
Do you have scarification/tribal marks?	
Have you had a dental procedure?	
Have you ever received a blood transfusion?	
Have you had a surgical operation?	
Have you had any contact with a known case of hepatitis B?	
Have you ever used tobacco or shisha?	
Have you ever drunk alcohol?	
Have you received the hepatitis B vaccine?	
If yes, how many shots did you receive?	
If yes, what are the benefits of hepatitis B vaccine?	
If no, what are the barriers to uptake of hepatitis B vaccine?	
If no, do you intend to receive it in the future?	
Have you ever had jaundice?	
Have you ever been tested for hepatitis B?	
If yes, when did you have your most recent hepatitis B test?	
If yes, what was the result of your last hepatitis B test?	

this research aimed to examine the content validity of a semi-structured questionnaire for the prevalence and risk factors of HBV infection among women of reproductive age in South Sudan. This tool, therefore, shall facilitate scholars in the quest for HBV-related concerns.

Method

This study adapted a quantitative cross-sectional research design to validate the contents of a research questionnaire. The panellists were selected based on the expertise relevant to this research study: public health, epidemiology, pathology, infectious diseases, obstetrics, and gynaecology, among other fields shown in Table 1. Nine panellists were selected, which is the sample size of this research study.[10] (Table 1).

The instrument comprised two key constructs: demographic characteristics and health behaviours (Table 2). Demographic variables are independent by nature and cannot be altered. Demographic variables may be numerical (age, income) or discrete (marital status).[11] Health behaviours are those that affect health and may be unintentional or intentional. Examples include unsafe sexual activities, substance abuse, seeking behaviours for health care, and adherence to recommended medical interventions.[12]

Table 2 illustrates a total of 29 items. The experts used the method of ranking these items following Likert's three scales: (1) Not necessary, (2) Useful but not essential, and (3) Essential.[13] Of the rated items, only the items rated as essential were considered for the analytic process using Formula 1 and Formula 2, built-in Power Pivot of Microsoft Office 365.

Formula 1: Lawshe's Content Validity Ratio (CVR)

$$\mathbf{CVR = [ne-(N/2)] /(N/2)}$$

Formula 2: Lawshe's Content Validity Index (CVI)

$$\mathbf{CVI = ne/N}$$

Where, ne ≡ Number of panellists who gave a rating of essential, N ≡ Total number of panellists.

Since the evaluation constituted nine experts, a minimum content validity ratio (CVR) of 0.78 was the threshold to retain the question in the final form or delete it. While CVR's value determines each question's validity, CVI provides the overall percentage of expert agreement on the questions. The CVI value ranges from 0.7 to 0.9, from acceptable to excellent. Nevertheless, a CVI < 0.7 indicates that the questionnaire might have issues, the instruction was unclear to the panellists, or the experts were biased/improperly selected.[13]

Table 3. CVR Analysis for Demographic Characteristic (DC) Construct

Items/xperts	E1	E2	E3	E4	E5	E6	E7	E8	E9	Ne	CVR
DC01	1	1	1	1	1	0	1	1	1	8	0.778
DC02	1	1	1	1	1	1	1	1	1	9	1.000
DC03	1	1	1	1	1	1	1	1	1	9	1.000
DC04	1	1	1	1	1	1	0	1	1	8	0.778
DC05	1	1	1	0	1	1	1	1	1	8	0.778
DC06	1	1	1	1	1	1	1	1	1	9	1.000
DC07	1	1	1	1	1	1	0	1	1	8	0.778
DC08	1	1	1	0	1	1	1	1	1	8	0.778
DC09	1	1	1	1	0	1	1	1	1	8	0.778
DC10	1	1	1	1	1	1	1	1	1	9	1.000
DC11	1	1	1	1	1	1	0	1	1	8	0.778
DC12	1	1	1	0	1	1	1	1	1	8	0.778
										CVI	**0.926**

0 ≡ Not necessary and useful but not essential, 1 ≡ Essential

Table 4. CVR Analysis for Health Behaviour (HB) Construct

Items/Experts	E1	E2	E3	E4	E5	E6	E7	E8	E9	Ne	CVR
HB13	1	1	1	1	1	1	1	0	1	8	0.778
HB14	1	1	1	1	1	1	0	1	1	8	0.778
HB15	1	1	1	1	1	1	1	1	1	9	1.000
HB16	1	1	1	1	1	1	1	1	1	9	1.000
HB17	1	1	1	1	1	1	1	1	1	9	1.000
HB18	1	1	1	1	1	1	0	1	1	8	0.778
HB19	1	1	1	1	1	1	1	1	0	8	0.778
HB20	1	1	1	0	1	1	1	1	1	8	0.778
HB21	1	1	1	1	1	1	1	1	1	9	1.000
HB22	1	1	0	1	1	1	1	1	1	8	0.778
HB23	1	1	1	1	1	1	0	1	1	8	0.778
HB24	1	1	1	1	1	1	1	1	1	9	1.000
HB25	1	1	1	1	1	1	0	1	1	8	0.778
HB26	1	1	1	1	1	1	0	1	1	8	0.778
HB27	1	1	1	1	1	1	1	1	1	9	1.000
HB28	1	1	1	1	1	1	1	0	1	8	0.778
HB29	1	1	1	1	1	1	1	1	0	8	0.778
										CVI	**0.928**

0 ≡ Not necessary and useful but not essential, 1 ≡ Essential

Ethical Considerations: Authorization and ethical clearance letters were obtained from the University of Juba Graduate College and the Ministry of Health Research Ethics Review Board. The study participants provided informed consent, and confidentiality was assured.

Results

Nine experts participated in validating 29 items of the questionnaire. Of these, 12 were demographic constructs, and 17 were health behaviour constructs. The CVI of the 29 items was 0.927.

Table 3 illustrates the analysis of CVR for demographic characteristic construct. All items of the demographic characteristic construct were retained as they passed the CVR threshold value of 0.78. These items include the name of the health facility, age in years, residential area in Juba City, religion, the highest level of education, employment status, marital status, and parity, among other variables. The overall CVI for the demographic characteristic construct stood at 0.926.

All items (17) of the health behaviour construct have surpassed the CVR threshold value of 0.78, and all were retained in the final semi-structured questionnaire. The overall CVI for the health behaviour construct was staged at 0.928 (Table 4).

Discussion

This study examined the content validity of the questionnaire for prevalence and risk factors of HBV infection among women of reproductive age in South Sudan. The 29 items of the questionnaire were adapted from previous studies. The derived items were age, residential area, religion, education, employment status, marital status, obstetric parity, substance use, tribal marks, and adherence to prescribed medical strategies.[5,7,8] Whether the research instrument is developed, standardized, or adapted, the validity must be established before using an instrument.[6] As a result, this study identified 29 items that surpassed the content validity ratio (CVR) threshold value of 0.78 or 78%.

From Lawshe, *"Any item, performance on which is perceived to be "essential" by more than half of the panellists, has some degree of content validity. The more panellists (beyond 50%) who perceive the item as "essential," the greater the extent or degree of its content validity."*[10]

Furthermore, this study revealed that the overall content validity index (CVI) for demographic characteristics and health behaviour constructs were staged at 0.926 and 0.830, respectively. These findings were in congruence with literature that asserts that the CVI of value ranges from 0.7 to 0.9, from acceptable to excellent. Nonetheless, a low CVI value indicates that the instrument might have problems with the items, unclear instruction to the experts, improper expert selection, or the expert himself is biased. Whereas CVR provides validity for each item, CVI describes the percentage of expert agreement for overall items in the instrument.[13]

Conclusion

The study necessitated validating a semi-structured questionnaire for assessing the prevalence and risk factors of hepatitis B virus among women of reproductive age. This tool indicated the essential items in this health domain. Therefore, it should assist researchers in collecting data related to hepatitis B.

Conflict of interest: None

Sources of funding: None

Author contributions: EW conceptualised this research study, managed the research study, arranged the methods, managed and processed the data, and drafted the manuscript; AC contributed to the concept of this study, provided a key role in shaping the direction of the research study and the manuscript writing; OS contributed to the conceptualizing this study, administrated research project and the manuscript writing; all authors reviewed the final manuscript and approved it for publication.

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Scaling up response to curb growing mpox outbreak in African region

10 September 2024

Press Release

In the wake of the current Mpox outbreak that has spread across 13 countries and led to over 18,000 cases in Africa in 2024, a delegation from Africa CDC visited South Sudan to assess its preparedness and response capabilities.

Dr Mazyanga Lucy Mazaba, the Regional Director for East Africa, led the Africa CDC mission to South Sudan, her first mission since her appointment in July 2024. The visit focused on strengthening collaboration between Africa CDC and the Ministry of Health in South Sudan, particularly in enhancing the country's public health security and response systems.

During the mission, Dr Mazaba met with South Sudan's Minister of Health, Yolanda Awel Deng, and other key officials, including Under Secretary Dr Harriet Pasquale. The delegation also engaged in discussions with Dr Kediende Chong, Director General of Preventive and Promotive Services and Africa CDC's focal point in South Sudan. These discussions centred on expanding Africa CDC's Emergency Operation Centres and enhancing the Field Epidemiology Training Programme (FETP) and surveillance systems.

A significant part of the visit involved detailed discussions on operationalising South Sudan's National Public Health Institute (NPHI). Both Dr Mazaba and Dr Angok Gordon Kuol, head of the institute NPHI reviewed ongoing programmes and explored additional support avenues, particularly in workforce development through the in-country FETP. Africa CDC is committed to advocating for the smooth transition of the NPHI into a fully functional entity capable of effectively coordinating public health activities nationwide.

*Read the full **original article** on **Africa CDC***

A five-year epidemiological study of tuberculosis and its related risk factors in northwestern Algeria

Walid Hassene Hamri[1,2], *Mustapha Diaf*[2,3] *and Fatima Zohra Hamadouche*[3]

Authors Affiliation:
1. Department of Biology, Faculty of Natural and Life Sciences, Mustapha Stambouli University, Mascara, Algeria.
2. Laboratory of Nutrition, Pathology, Agro-Biotechnology, and Health, Algeria.
3. Department of Biology, Faculty of Natural and Life Sciences, Djillali Liabes University, Sidi-bel-Abbes, Algeria.

Correspondence:
Walid Hassene Hamri,
walidhamri@univ-mascara.dz

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ABSTRACT

Introduction: Tuberculosis (TB) is a worldwide emergency and a leading cause of death. Algeria reported an incidence rate between 53 and 88 per 100,000 in 2017. This study aimed to highlight TB's clinical and therapeutic characteristics at the Pulmonology Unit in Sidi Bel Abbes, Algeria.

Method: This retrospective and descriptive study analysed patient records from 2015 to 2020. Data collected included sociodemographic data, clinical characteristics, type of TB, and therapeutic evolution after each patient's treatment period. Data were processed using SPSS.

Results: Of the 649 TB patients, 57.3% had extra-pulmonary TB, with a higher proportion of females affected. Pulmonary TB cases were predominantly male, and bi-therapy with isoniazid and rifampicin was the most common treatment. Just over half of cases (55.2%) achieved treatment success.

Conclusion: Although TB incidence gradually declined over the study period, increased attention to extra-pulmonary TB and adherence to treatment protocols are recommended.

Keywords: bi-therapy, lymphadenitis, tuberculin intradermal reaction, tuberculosis, Algeria.

Introduction

Tuberculosis (TB) is an infectious disease caused by Mycobacterium tuberculosis (MTB) or Koch's bacillus.[1] It remains a global public health emergency and a leading cause of death. In 2022, it ranked as the second leading cause of mortality from a single pathogen after COVID-19, far exceeding deaths caused by HIV/AIDS.[2] Algeria reported an incidence rate between 53 and 88 per 100,000 in 2017.[3]

Pulmonary TB, the most contagious form,[4] coexists with extra-pulmonary TB, which accounts for about 20-25% of global cases.[5] This study investigated the clinical characteristics of TB in Sidi Bel Abbes, focusing on epidemiological trends and therapeutic outcomes between 2015 and 2020.

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The treatment implements concurrently four first-line anti-tubercular medications: isoniazid (H), rifampicin (R), ethambutol (E), and pyrazinamide (Z).[6] According to the latest WHO guidelines, the recommended 6-month therapy regimen is based on short-course therapy with H, R, E, and Z for two months, followed by four months of H and R.[2] A feared complication of anti-TB therapy is multi-drug-resistant TB, which is distinguished by its resistance to first-line medications H and R.[7]

As TB is a serious disease in Algeria,[8] it is necessary to determine the epidemiology according to the specific geographical conditions. We conducted this retrospective study to investigate underlying factors (including age, sex, region, and related diseases) over five years (between 2015 and 2020). This is the first TB-based retrospective study examining the clinical and therapeutic characteristics of TB in northwestern Algeria.

Methods

This retrospective study was conducted at the Pulmonology Unit of the hospital-university centre in Sidi Bel Abbes province, northwestern Algeria, which has a population of 713,377.

We included all tuberculous patients declared at the diagnostic unit from January 2015 to December 2020. Patients with incomplete files were excluded. Data collected included socio-demographic data (age, sex, place of residence), clinical characteristics, type of TB (pulmonary, extrapulmonary), and therapeutic evolution (healing, failures, death) after each patient's treatment period.

Data were processed using SPSS version 27.0. The qualitative variables were summarized in percentages, and the Chi-square test was used to compare the categorical variables, with statistical significance set at a p-value ≤ 0.05.

Ethical clearance was obtained from the Pulmonology Unit, and patient identities remained confidential.

Results

Epidemiological Trends

649 TB cases were recorded during the study period, with the incidence declining from 19.21 per 100,000 in 2015 to 14.30 in 2020 (see table 1). However, a slight increase was observed in 2018. Pulmonary TB cases were more common in males (64.3%), while extra-pulmonary TB predominated in females (73.1%).

Table 1. Incidence of all forms of TB per 100,000 inhabitants between 2015-2020

Year	Total (N=649) n (%)	Incidence per 105
2015	133 (20.5)	19.21
2016	109 (16.8)	15.68
2017	101 (15.6)	14.39
2018	108 (16.6)	15.24
2019	95 (14.6)	13.31
2020	103 (15.9)	14.30

Patient Characteristics

The mean patient age was 36.6 years, with the 20-29 age group most affected (26.3%). Most patients (88.4%) resided in urban areas (see table 2). Co-morbidities included hypertension (5.5%), bronchial asthma (4.0%), and diabetes mellitus (2.9%). A tuberculin test was conducted on 53.6% of patients, with a 57.5% positivity rate.

Distribution by TB Type and Location

Extra-pulmonary TB accounted for 57.3% of cases, with lymphadenitis TB being the most common (39.8%), followed by pleural TB (8.6%) (see Table 3). Among pulmonary TB cases, 64.3% were male, while 73.1% of extra-pulmonary TB patients were female.

Treatment Regimens

Bi-therapy with isoniazid and rifampicin (RH) was prescribed to 46.1% of patients, followed by quadruple therapy (RHZE) in 22.2% of cases (see table 4). Treatment duration varied, with a two-month regimen applied to 55.6% of cases. Treatment success was reported in 55.2% of cases, with pulmonary TB patients showing better outcomes (81.6%) than extra-pulmonary TB patients (35.5%).

Relapse and Mortality

Relapse occurred in 4% of cases, predominantly in pulmonary TB patients (6.1%). The overall mortality rate was 1.5%, higher among pulmonary TB cases (2.5%) than extra-pulmonary cases (0.8%) – see table 5.

Discussion

TB remains a serious public health problem. In 2022, an estimated 1.3 million TB deaths were registered by WHO

globally.[2] In developing countries, such as Algeria, this disease is highly endemic. Our analysis highlighted that TB morbidity had decreased by 25.56% (from 19.21 to 14.30 per 100,000 population) in Sidi Bel Abbes from 2015 to 2020, with average annual morbidity of 15.36/100,000, far lower than that reported in Algeria in 2017 (32.70 per 100,000 population),[9] which was closely linked to the local policies to control the incidence of TB.

In the current study, 57.2% (n=371) of the patients were females; of those, 272 (73.3%) had extra-pulmonary TB. The disaggregated gender differences show that women are a high-risk group for various forms of extra-pulmonary TB. Ben Ayed et al. reported that males were more likely to develop TB than females (54.4% vs. 45.6%). In contrast, the extra-pulmonary TB form was more common in females, notably lymphadenitis TB.[10] A similar study done in China reported that extra-pulmonary TB is predominant in women compared to pulmonary TB (39.7% vs. 29.9%, OR = 1.37).[11] Likewise, a two-year cohort study by Khan et al. revealed that the incidence of TB is 1.31 times higher in females, indicating that biological sex is an important determinant of health because gender disparities in genetic, epigenetic, and hormonal regulation alter the prevalence and manifestation of TB.[12]

Most of our patients were young adults aged 20 to 49 years. Similar findings were noted in a study conducted in the Maghreb countries by M. Adnaoui et al., where 70% of those affected by TB were between 20 and 45 years

Table 2. Characteristics of TB cases

Variables	Total (N=649) n (%)
Sex	
Male	278 (42.8)
- Pulmonary TB	178 (27.4)
- Extra-pulmonary TB	100 (15.4)
Female	371 (57.2)
- Pulmonary TB	99 (15.3)
- Extra-pulmonary TB	272 (41.9)
Age range	
3-9 years	17 (2.6)
10-19 years	65 (10.0)
20-29 years	171 (26.3)
30-39 years	139 (21.4)
40-49 years	112 (17.3)
50-59 years	82 (12.6)
60-69 years	39 (6.0)
70-79 years	18 (2.8)
≥ 80 years	6 (0.9)
Environment	
Urban	574 (88.4)
Rural	75 (11.6)
Co-morbidities	
Anaemia	18 (2.8)
Bronchial asthma	26 (4.0)
Diabetes	19 (2.9)
Goiter	12 (1.8)
Hypertension	36 (5.5)
Lupus erythematosus	3 (0.5)
Tuberculin test	
Negative IDR	148 (22.8)
Positive IDR	200 (30.8)
Not done	301 (46.4)

IDR: tuberculin intradermal reaction. TB: tuberculosis.

Table 3. Distribution of all forms of TB patients based on location

Forms of tuberculosis	Total (N=649) n (%)
Type	
Pulmonary	277 (42.7)
Extra-pulmonary	372 (57.3)
Localization	
Skin	13 (2.0)
Lymphadenitis	258 (39.8)
Miliary	10 (1.5)
Osteoarticular	3 (0.5)
Parotid	1 (0.2)
Peritoneal	19 (2.9)
Pleural	56 (8.6)
Pulmonary	267 (41.1)
Genito-urinary	5 (0.8)
Uveitis	16 (2.5)
Ear Nose and Throat (ENT) sphere	1 (0.2)

Table 4. CVR Analysis for Health Behaviour (HB) Construct

Anti-tuberculosis treatment	Total (N=649) n (%)	Pulmonary TB (N=277) n (%)	Extra-pulmonary TB (N=372) n (%)	p-value
FDC drugs				
RH	299 (46.1)	122 (44.0)	177 (47.6)	
RHE	15 (2.3)	4 (1.4)	11 (3.0)	0.225
RHZ	191 (29.4)	84 (30.3)	107 (28.8)	
RHZE	144 (22.2)	67 (24.2)	77 (20.7)	
Duration				0.990
2-month regimen	361 (55.6)	154 (55.6)	207 (55.6)	
4-month regimen	288 (44.4)	123 (44.4)	165 (44.4)	

(*) percentages were compared with the Chi-square test, and p ≤ 0.05 was considered significant.

FDC: Fixed-dose combination; R: rifampin; H: isoniazid; Z: pyrazinamide; E: ethambutol.

Table 5. Distribution according to therapeutic outcomes

Anti-tuberculosis treatment	Total (N=649) n (%)	Pulmonary TB (N=277) n (%)	Extra-pulmonary TB (N=372) n (%)	p-value
Healing	358 (55.2)	226 (81.6)	132 (35.5)	
Positive biopsy	265 (40.8)	34 (12.3)	231 (62.1)	0.001*
Relapses	26 (4.0)	17 (6.1)	9 (2.4)	
Death	10 (1.5)	7 (2.5)	3 (0.8)	0.079

(*) percentages were compared with the Chi-square test, and p ≤ 0.050 was considered significant. TB: tuberculosis.

old. The study was done in Tunisia, Morocco, and Algeria, which are all middle-income countries. Considering this is a major economically productive age group, the economic and social impact of TB is massive.[13]

Increasing attention should also be focused on patients over 60, whose immunity has generally weakened and are thus prone to infection or relapse. Interestingly, some researchers demonstrated that the TB vaccine was more likely beneficial for patients under 50 years old and less effective for older patients, with an average efficacy of only about 50% for the latter.[14]

Most of our cases were from urban regions. These results are in line with current literature, which shows that TB is easily spread among overcrowded areas such as universities, supermarkets, and stadiums.[15] The exposure risk of TB follow-up with no surveillance may result in a delay in the diagnosis of TB and thus cause its outbreak.

Extra-pulmonary TB accounted for 57.3% of all cases recorded during the study period. This value is higher than those reported in previous studies, in which 45.2%, 43.8%, 33.4%, and 13.1% of cases had localized at the extra-pulmonary level found in Turkey, Algeria, China, and Malaysia, respectively.[4,8,11,12] In contrast, this value was similar to that reported in 59.5% of extra-pulmonary TB cases found in Tunisia.[10] Extra-pulmonary TB is usually not an infectious disease. However, it can cause death if undiagnosed or untreated. Lymphatic and pleural involvement are the most frequent clinical forms of extra-pulmonary TB, as also found in other studies.[4,8,12] Indeed, there is an unexplained resurgence of the extra-pulmonary forms, especially lymphadenitis and pleural effusion, with a relative frequency reaching up to 40%.[16] In this study, the mortality rate was 1.5%. Surprisingly, this rate is lower than that found in an epidemiological survey by Boualam et al.[17]

A noteworthy discovery from this research is that most pulmonary and extra-pulmonary TB cases were treated with a bi-therapy regimen for two to four months. Undeniably, these recommended regimens are specifically able to treat TB sustained by both drug-susceptible and drug-resistant strains without interfering with other drugs. The adoption of multiple drug combinations can improve the prognosis.[18]

Conclusion

TB incidence in northwestern Algeria has decreased, but the disease remains a serious public health concern. Particular attention should be given to extra-pulmonary TB and urban residents, with efforts to improve public education and treatment adherence. Monitoring and strengthening local TB control strategies are essential to sustain progress and address emerging challenges.

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WHO supports South Sudan amid severe flooding

October 2024

The World Health Organization (WHO) is working with authorities and partners in South Sudan as the country faces some of the worst flooding in decades, affecting 42 out of 78 counties and impacting some 890,000 people.

Although heavy downpours during the rainy season between April and November often trigger floods, they have become increasingly severe due to climate change, WHO said.

So far, more than 226,000 people have been displaced, and roads and key infrastructure have been submerged. This includes 58 health facilities, while nearly 90 others are inaccessible.

The floods have exacerbated the already dire humanitarian situation in the country, which is hosting almost 800,000 refugees and returnees fleeing the war in neighbouring Sudan.

Most refugees and returnees pass through Renk county in Upper Nile state, where two suspected cholera cases have been detected. Meanwhile, malaria is on the rise, with more than 120,000 suspected cases and 31 suspected deaths as of late September.

WHO has distributed about 88 metric tonnes of emergency health kits to Renk and other key locations to assist flood-affected communities. The kits can treat over 870,000 people and include critical medical supplies such cholera treatment and antimalarial drugs.

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Research Article

Improvised explosive device injuries to the maxillofacial region: Diagnostic findings and treatment approaches in north-eastern Nigeria

Mohammed Adam Sheikh Abdullahi[1], Mujtaba Bala[2], Suleiman Abdul Rasheed[3], Mohammed Alhaji Ahmed[4], Muktar Ahmad Modibbo[1] and Ibrahim Muhammad Shehu[1]

Authors Affiliations:

1. Oral and Maxillofacial Surgery Department, University of Maiduguri Teaching Hospital, Maiduguri, Borno State, Nigeria
2. Oral and Maxillofacial Surgery Department, Usamanu Danfodio University Teaching Hospital, Sokoto, Sokoto State, Nigeria
3. Oral and Maxillofacial Surgery Department, Aminu Kano Teaching Hospital, Kano, Kano State, Nigeria
4. Anesthesia Department, University of Maiduguri Teaching Hospital, Maiduguri, Borno State, Nigeria

Correspondence:
Mohammed Adam Sheikh Abdullahi
muhdabdullahi@yahoo.com

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ABSTRACT

Introduction: The use of improvised explosive devices (IED) poses a significant threat, particularly in low- and middle-income countries. These homemade explosives incorporate certain objects that create unique injury patterns that present diagnostic and therapeutic challenges. This study examines the maxillofacial wounds and patterns of Boko Haram IED victims treated at the University of Maiduguri Teaching Hospital (UMTH). Understanding the different wounding patterns these injuries cause and management options will help with proper planning and management.

Method: This retrospective study was carried out over five years at UMTH, Nigeria. The clinical records and treatment approaches of IED injuries to the maxillofacial region were obtained from patient case notes. Data were analyzed using the statistical software SPSS version 20.

Results: The study involved 14 patients, 14–43 years old. There were three (21.4%) females, M:F ratio of 4.7:1. Primary blast injuries were seen in six (42.9%). Lacerations were the most common facial injury at 31.7%%. The most common facial fractures recorded were naso-orbitoethmoidal at 21.9%, maxillary at 18.8%, and frontal bone fractures at 15.6%. Globe rupture occurred in six (42.9%). The most common treatment was closed reduction with intermaxillary fixation (57.4%).

Conclusion: Intermaxillary fixation emerged as the predominant treatment modality, reflecting the pragmatic use of available resources. Prevention is critical to reducing IED injuries.

Keywords: improvised explosive device, maxillofacial injury, resource-limited setting, Nigeria

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Introduction

The Boko Haram insurgency in north-eastern Nigeria, which began in 2009 with Borno State as its epicentre, has been defined by bombings, kidnappings, and attacks on significant sites, affecting millions in the region.[1] The utilisation of Improvised Explosive Devices (IEDs) in the groups' guerrilla-style tactics

presented substantial security obstacles, resulting in mass casualties inflicting multiple injuries primarily from these explosives and, firearms impacting civilians, military, including the insurgents.[2] These homemade explosives are manufactured using commercial blasting supplies or fertilizers, and they often include nails, bolts, and other sharp objects. These objects cause distinct injury patterns that provide diagnostic and treatment difficulties for healthcare practitioners.[3]

Maxillofacial injuries are becoming increasingly important due to the potential for significant psychological, social, and economic effects resulting from disfigurement and trauma in this area.[4] The maxillofacial region is connected to important structures crucial for clinical care and outcomes.[4] While numerous studies have explored the general impact of IED injuries on the body, there remains a lack of focused research on the specific diagnostic and treatment challenges of maxillofacial injuries caused, particularly in conflict zones like North-eastern Nigeria.[3,4] Existing literature often overlooks the unique anatomical complexities of the facial region and the socio-economic and infrastructural challenges that impact effective treatment in such settings, underscoring the need for context-specific data and treatment protocols tailored to resource-limited environments.[4] This retrospective study examines the maxillofacial wounds and patterns of Boko Haram IED victims treated at the University of Maiduguri Teaching Hospital.

Method

This retrospective study was carried out at the Department of Oral and Maxillofacial Surgery, University of Maiduguri Teaching Hospital (UMTH), Borno State, Nigeria, over 5 years from 2016 to 2022 at the peak of the insurgency period. A sample was chosen from the existing data and included all IED victims with maxillofacial injuries who presented to the tertiary hospital. Injuries to the maxillofacial regions were categorised as soft tissue injuries, including facial burns, abrasion, contusion, laceration, avulsion injury, or hard tissue injury: dento-alveolar, maxillary, mandibular, zygomatic complex, naso-orbito-ethmoidal, frontal, and pan-facial fractures. The study protocol was approved by the Ethics Review Committee of UMTH (OHRP-IRB00013572 UMTH/REC/23/1105). The patients' files were reviewed for demographics, diagnostic findings, primary blast injury type, injury severity score, soft tissue injury, hard tissue injury, and treatment approaches.

Data were entered in Microsoft Excel (version 20) and cleaned of errors. Statistical analyses were performed using statistical software SPSS version 20.0 for Windows (SPSS Inc.).

Table 1. Demographic data and Primary blast injuries

Age	Male n (%)	Female n (%)	Total n (%)
Birth – 25 years	2 (14.3)	2 (14.3)	4 (28.6)
25 – 34 years	5 (35.7)	1 (7.1)	6 (42.8)
> 34 years	4 (28.6)	0 (0.0)	4 (28.6)
Total	11 (78.6)	3 (21.4)	14 (100.0)
Occupation			
Military	6 (42.9)	0 (0.0)	6 (42.9)
Civilian	5 (35.7)	3 (21.4)	8 (57.1)
Total	11 (78.6)	3 (21.4)	14 (100.0)
Injury			
Globe rupture	6 (42.9)	0 (0.0)	6 (42.9)
Middle ear damage	3 (21.4)	0 (0.0)	3 (21.4)
Abdominal haemorrhage	0 (0.0)	0 (0.0)	0 (0.0)
Blast lung	0 (0.0)	0 (0.0)	0 (0.0)
Concussion	0 (0.0)	1 (7.1)	1 (7.1)
Total	**9 (64.3)**	**1 (7.1)**	**10 (71.4)**

Table 2. Distribution of concomitant injuries

Variables	Presence of concomitant injuries		p-value
	No n (%)	Yes n (%)	
Sex			
Male	4 (28.6)	7 (50)	0.193
Female	3 (21.4)	0 (0)	
Occupation			
Military	2 (14.3)	5 (35.7)	0.285
Civilian	5 (35.7)	2 (14.3)	

Results

The study consisted of 14 patients aged 14 to 43 years, with a mean age of 29.5 years (SD = 8.81). Females formed 21.4% of the group, with a male-to-female ratio 4.7:1 (Table 1). Primary blast injuries were identified in six patients (42.9%) (Table 1).

When analyzing sex differences in concomitant injuries, 50% of males presented with such injuries, whereas no females did. However, this difference was not statistically significant (p = 0.193). Similarly, the proportion of military personnel with additional injuries (35.7%) exceeded that of civilians (14.3%), though this, too, was not statistically significant (p = 0.285) (Table 2).

Only 7.2% of participants reported using protective gear, which appeared to be associated with less severe injuries (ISS < 15), although the association was not statistically significant (p = 0.260) (Table 3). Lacerations were the most frequently reported soft tissue injuries, while the most common facial fractures were naso-orbitoethmoidal (21.9%), maxillary (18.8%), and frontal fractures (15.6%) (Table 4).

Orbital globe rupture was seen in six patients (42.9%). The most frequently employed treatment method was closed reduction with intermaxillary fixation, used in 57.4% of cases (Figure 1). One patient did not survive the injury.

Table 3. Use of protective gear and injury severity score among participants

Protective gear	ISS<15 n (%)	ISS>15 major trauma n (%)	ISS 75 un-survivable n (%)	Total n (%)	p-value
No	3 (21.4)	9 (64.3)	1 (7.2)	13 (92.8)	
Yes	1 (7.2)	0 (0)	0 (0.0)	1 (7.2)	
Total	4 (28.6)	9 (64.3)	1 (7.2)	14 (100)	0.260

Table 4. Facial soft and hard tissue injury recorded

Injury type	Male n (%)	Female n (%)	Total n (%)	p-value
Soft tissue injury				
Burns	6 (17.1)	0 (0.0)	6 (14.6)	
Abrasion	7 (20.0)	2 (33.3)	9 (22.0)	
Contusion	5 (14.3)	0 (0.0)	5 (12.2)	
Laceration	10 (28.6)	3 (50.0)	13 (31.7)	
Avulsion	7 (20.0)	1 (16.7)	8 (19.5)	
Total	35 (100.0)	6 (100.0)	41 (100.0)	
Hard tissue injury				
Dento-alveolar frac-ture	4 (14.3)	0 (0.0)	4 (12.5)	0.546
Maxillary	5 (17.9)	1 (25.0)	6 (18.8)	
Mandibular	2 (7.1)	2 (50.0)	4 (12.5)	
Zygomatic complex	3 (10.7)	0 (0.0)	3 (9.4)	
Naso-orbito-ethmoidal	7 (25.0)	0 (0.0)	7 (21.9)	
Frontal	4 (14.3)	1 (25.0)	5 (15.6)	
Pan facial	3 (10.7)	0 (0.0)	3 (9.4)	
Total	**28 (100.0)**	**4 (100.0)**	**32 (100.0)**	**0.244**

Discussion

These results show that a more significant percentage of males suffered from IED maxillofacial injuries, considering the increased risk and susceptibility of this group during war. Most military and insurgency combatants are male. This observed higher incidence of male casualties supports previous research conducted by Aras M et al.,[5] and that by Chaiprom et al.[6] The age group with the highest incidence of maxillofacial injuries was 25-34 years, accounting for 42.8% of cases. This may be related to their propensity for risk-taking and sense of invulnerability in this age group.

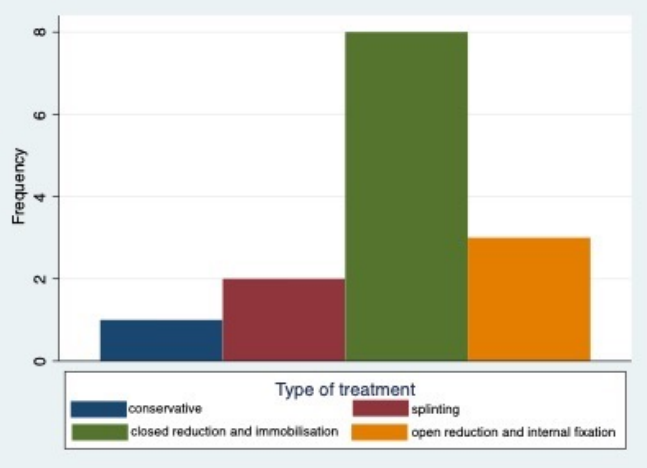

Figure 1. Type of treatment of facial fractures.

Concerning primary blast injuries, over half of the individuals in the study experienced these injuries. Orbital globe rupture (Figures 2 and 3), accounting for 42.9% of primary blast injuries in this study, underscores the vulnerability of the ocular structures to the high-energy forces and projectiles generated by IEDs. The blast waves and shrapnel from such explosions can cause significant ocular damage, leading to globe rupture, which is a severe and vision-threatening condition.[7] Primary blast injuries are often generated by a shock wave of excessive pressure, followed by a wave of reduced pressure, which passes through the body.[3, 4] This injury›s prevalence highlights the ocular structures› vulnerability in blast environments.

Previous literature supports these findings. Mader et al. (2006) emphasized the vulnerability of the eyes to blast waves among military personnel exposed to explosive devices.[7] Weichel et al. (2008) highlighted the common occurrence of ocular injuries, such as globe ruptures, in soldiers injured by IEDs, indicating a significant risk to vision.[8] Comparatively, globe rupture as a primary blast injury is less commonly reported in civilian trauma settings, where the mechanisms of injury differ, such as in traffic accidents or falls, which typically result in different types of ocular trauma.[9] The high incidence of globe rupture in blast injuries underscores the need for protective measures and rapid medical intervention to mitigate the severe consequences.

Figure 2. A: patient at presentation with degloving facial injury and multiple fractures. B: Patient at one month post operatively. (Credit: Mohammed Adam Sheikh Abdullahi)

Figure 3. Patient at presentation with bilateral globe rupture, lip laceration, and multiple abrasions and 1 month post operatively. (Credit: Mohammed Adam Sheikh Abdullahi)

The observed higher incidence of naso-orbitoethmoidal (NOE), maxillary, and frontal fractures in the context of improvised explosive device (IED) injuries can be attributed to the nature of these explosive forces, which often generate high-velocity projectiles and blast waves that predominantly impact the central facial region (Figure 4). This finding is consistent with the literature on maxillofacial trauma in conflict zones, where the direction and intensity of the blast influence the distribution of facial fractures.

Previous studies have documented similar patterns. A study by Levin et al. (2008) on maxillofacial injuries in military personnel found that NOE fractures were among the most common due to the central position of the nose and orbits, which are frequently impacted by explosive forces.[10] Similarly, Masud et al. (2013) reported a high prevalence of maxillary and frontal fractures in victims of IED blasts in Afghanistan, emphasizing the vulnerability of the midface and upper facial skeleton to such injuries.[11]

In comparison, in non-conflict environments, the distribution of facial fractures is often more varied, with mandibular fractures typically being more prevalent due to different mechanisms of injury, such as assaults and traffic accidents.[12] However, the concentration of NOE, maxillary, and frontal fractures in blast injuries underscores the unique injury patterns associated with high-energy explosive forces, which differ significantly from those observed in peacetime trauma.

The high prevalence of closed reduction with intermaxillary fixation (IMF) as a treatment modality aligns with the pragmatic approach often necessitated by limited resources and the lack of health insurance coverage. Closed reduction with IMF is a widely accepted method for managing facial fractures, particularly in environments where advanced surgical facilities and equipment may be scarce. This approach minimizes the need for extensive surgical intervention and relies on relatively accessible materials, making it suitable for resource-constrained settings. Adebayo et al. (2013) emphasized that in Nigerian tertiary hospitals, IMF was the primary method for treating mandibular fractures due to resource limitations and practicality in managing complex injuries.[13] Another study in Iraq by Al-Issawi et al. (2015) found IMF commonly used in treating maxillofacial injuries from explosive devices, highlighting its usefulness in conflict zones with limited surgical resources.[14]

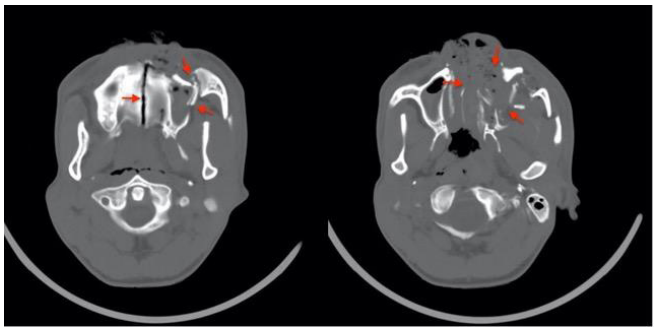

Figure 4. Axial scanograms showing NOE, right maxillary, zygomatic complex fracture, and palatal split. (Credit: Mohammed Adam Sheikh Abdullahi)

The preference for IMF in these settings contrasts with higher-resource environments, where open reduction and internal fixation (ORIF) using plates and screws is more commonly employed due to its potential for more precise anatomical alignment and faster functional recovery.[15] However, IMF remains a vital option in low-resource settings due to its lower cost, ease of implementation, and effectiveness in achieving satisfactory clinical outcomes without advanced surgical infrastructure.

In the long term, individuals with major maxillofacial injuries from IEDs face chronic pain, speech difficulties, and disfigurement, necessitating extensive surgeries. They also endure post-traumatic stress disorder, anxiety, and social isolation, which are exacerbated in regions with limited healthcare access.[14] Treating maxillofacial injuries from IEDs in northeastern Nigeria is impeded by insufficient surgical expertise, limited advanced imaging, scarce rehabilitation, psychosocial support, and inadequate post-operative care. Sustainable solutions include training local healthcare providers and enhanced international collaboration.

Conclusion

Intermaxillary fixation emerged as the predominant treatment modality, reflecting the pragmatic use of available resources. The prevalence of NOE, maxillary, and frontal fractures underscores the central facial region›s vulnerability to high-energy explosive forces. Additionally, the high incidence of globe rupture as the most common primary blast injury highlights the severe impact of IEDs on ocular structures. These findings emphasize the need for specialized training and proper planning to improve outcomes for individuals affected by blast-related maxillofacial trauma.

A more extensive, future study on long-term outcomes of IED-induced maxillofacial injuries in resource-limited settings could provide evidence-based guidelines, improve surgical techniques, and enhance rehabilitation services. Findings from this larger study will guide specialized training for holistic healthcare in conflict zones.

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Patients› consents: Consent was obtained from patients whose photographs are shown.

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Research Article

Attitudes of university students in Sudan towards digital mental health

Sara Hassan Mustafa[1,2], Elsir Abdelmutaal Mohammed[2], Salma Taha Makkawi[2] and Yassin Youssif Mohammed[3]

Authors Affiliations:
1. Alnazir for Research and Consulting, Khartoum, Sudan
2. Cluster II Saudi Board for Preventive Medicine, Riyadh, Saudi Arabia
3. Ministry of Health, Shendi, Sudan

Correspondence:
Sara Hasson Mustafa
hsarra@gmail.com

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ABSTRACT

Introduction: University students are particularly vulnerable to mental health illnesses. Access to mental health services in Sudan is limited. Digital mental health presents a promising approach that young people widely accept. The study aimed to assess the attitude of university students in Sudan toward digital mental health.

Method: A cross-sectional survey was conducted among university students in Khartoum using a self-administered electronic questionnaire. Data were collected between June 19 and July 30, 2022.

Results: Four hundred and thirty-two responses to the questionnaire were received, with a mean age of 20.37 years. Overall, 95.1% of respondents were willing to search online for mental health information, and 71.1% were willing to try a mental health teleconsultation. The perceived barriers to digital mental health included a preference for traditional consultations (35.6%) and a lack of trust in online providers (18.8%).

Conclusion: Digital mental health has the potential to play a significant role in increasing access to mental health care for university students in Sudan.

Keywords: digital mental health, university students, Sudan, LMICs, barriers.

Introduction

Living in a politically and economically disturbed context, Sudanese medical students suffer a higher prevalence of mental distress compared to their peers in other countries in the region.[1,2,3] Despite this high prevalence, most medical students remain untreated due to attitudinal barriers and a lack of mental health services and specialized personnel.[2,4,5,6]

There is strong evidence for the benefits of digital mental health interventions for both the general public and university students.[7,8,9] Research indicates that digital interventions for adolescents and young people are comparable to face-to-face care and better than no care.[9] The reported benefits of digital mental

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health interventions are particularly significant in low and middle-income countries, where access to care is limited.[9,10,11] Although Africa is understudied, research has revealed encouraging results.[11]

University students worldwide express a strong need for and interest in mental health information and tools, with a positive overall perception.[7] A wide range of digital interventions has been found effective or partially effective in reducing symptoms of mental health disorders in this population.[11,12,13]

It is crucial to test new and innovative approaches to mental health care, including digital mental health, to address the increasing prevalence of mental health issues and the challenges of limited accessibility.

This study investigates the attitudes and perceived barriers university students in Sudan have toward digital mental health.

Method

This cross-sectional study was conducted among medical students in medical colleges in Khartoum, Sudan. Data were collected between June 19 and July 30, 2022. Undergraduate students currently enrolled in the academic program and aged 16 and up met the inclusion criteria. The researchers designed the self-administered electronic questionnaire, pretested it for validation, and shared it through various social media platforms, such as Facebook, Telegram, and WhatsApp, for voluntary and anonymous participation. Descriptive statistics in frequencies and percentages were used to represent socio-demographic data and mental health care-seeking behaviour. The attitude towards digital mental health was measured using a Likert scale. Chi-square and Fisher's exact tests were used to compare differences in proportions between groups. A p-value less than 0.05 was considered statistically significant.

The Khartoum State Ethical Committee approved the study.

Results

A total of 432 valid responses were received. Females represented 72.7% of the sample. The students' mean age was 20.4 years. Nearly all respondents (99.1%) owned a smart device and used social media daily. (Table 1).

Overall, 95.1% of the respondents said they would look for online mental health information, and 71.1% said they are willing to try a teleconsultation for mental health treatment (Table 1). About two-thirds of the respondents were willing to use a mental health mobile application (Table 2). Face-to-face consultations with a doctor were the preferred method of receiving mental health care (72.7%) (Table 1).

The most frequently perceived barrier to receiving mental health treatment was waiting for the symptoms to disappear by themselves (19.4%, 84). The most frequently reported barrier to digital mental health was a preference for face-to-face consultations (35.6%).

Discussion

Digital mental health is developing rapidly, presenting an opportunity to improve mental health in countries with limited resources. This study aimed to understand the attitudes and perceived barriers that medical students in Sudan have regarding the emerging field of digital mental health.

Like their peers in other countries, respondents reported a high rate of owning a smart device and using social media.[14] This finding highlights the potential of digital mental health to reach university students in Sudan. University students' interest in online mental health information is common, regardless of their health situation.[7] Worldwide, a third of university students searched for mental health information at least once.[7]

Another benefit recognized by global mental health research is using digital health interventions such as online therapy, education, and support groups.[7,15] Two-thirds of this study's respondents agreed they would use these applications. Research shows that university students appreciate the confidentiality and flexible access digital mental health tools provide.[15]

A significant proportion (71.1%) expressed a willingness to try mental health teleconsultation. However, most respondents preferred traditional consultations, illustrating the need for human interaction. Young people and adolescents generally report a strong preference for face-to-face mental health interventions and a preference for digital interventions with a human element compared to those without.[9] A human component of internet-based mental health interventions increases their effectiveness and acceptability by young people.[9,15]

This study is subject to the limitations of a cross-sectional design. The small sample size and potential self-selection bias may affect the generalizability of the study

Table 1. Socio-demographic characteristics and acceptance of digital mental health

Variable	Category	(n= 432) n (%)	Willing to search for online mental health information n (%)	p-value	Willing to try a mental health teleconsultation n (%)	p-value
Overall		432 (100)	411 (95.1)		307 (71.1)	
Age groups	16-19	156 (36.1)	150 (96.2)	0.461	102 (65.4)	0.033
	20 -28	276 (63.9)	261 (94.6)		205 (74.3)	
Sex	Male	118 (27.3)	109 (92.4)	0.086	82 (69.5)	0.371
	Female	314 (72.7)	302 (96.2)		225 (71.7)	
Own a smart device	No	4 (.9)	408 (95.3)	0.181	305 (71.3)	0.329
	Yes	428 (99.1)	3 (75.0%)		2 (50.0)	
Use of social media	I use it rarely	9 (2.1)	9 (100.0)	0.301	5 (55.6)	0.155
	I use it every few days	13 (3.0)	11 (84.6)		6 (46.2)	
	I use it daily a few times	142 (32.9)	135 (95.1)		103 (72.5)	
	I use it every day all day	268 (62.0)	256 (95.5)		193 (72.0)	
Perceived need for mental health treatment	No	200 (46.3)	189 (94.5)	0.362	131 (65.5)	0.012
	Yes	232 (53.7)	222 (95.7)		176 (75.9)	
Preferred mental care provider	Face-to-face consultation with a doctor	314 (72.7)	296 (94.3)	0.057	222 (70.7)	
	A face-to-face meeting with a traditional or religious healer	17 (3.9)	17 (100.0)		10 (58.8)	
	A teleconsultation with a doctor or therapist	42 (9.7)	42 (100.0)		40 (95.2)	
	Internet-based treatment without a therapist	32 (7.4)	32 (100.0)		22 (68.8)	
	Family and friends	9 (2.1)	7 (77.8)		5 (55.6)	
	Ouran and prayer	9 (2.1)	9 (100.0%)		5 (55.6)	
	Myself	9 (2.1)	8 (88.9)		3 (33.3)	
Received mental health care in the last 12 months	No	393 (91)	374 (95.2)	0.583	280 (71.2)	0.460
	Yes	39 (9)	37 (94.9)		27 (69.2)	

Table 2. Willingness to try digital mental health interventions

Digital health service Willingness to:	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)
Join an online mental health support group	17 (3.9)	55 (12.7)	98 (22.7)	132 (30.6)	130 (30.1)
Use a mobile app for mental health treatment	22 (5.1)	60 (13.9)	89 (20.6)	134 (31.0)	127 (29.4)
Search for online mental health information	5 (1.2)	16 (3.7)	37 (8.6)	128 (29.6)	246 (56.9)
Receive a teleconsultation for mental health treatment (telepsychiatry)	30 (6.9)	95 (22.0)	84 (19.4)	125 (28.9)	98 (22.7)

Table 3. Medical students' self-reported barriers to mental health care

Barriers to mental health care (n= 432)	Present n (%)
Unsure where to find mental health treatment	83 (19.2)
Waiting for the symptoms to disappear by themselves	84 (19.4)
Fear of stigma	25 (7.9)
Wanting to handle the problem alone	101 (23.4)
High cost of treatment	68 (15.7)
Afraid of mental illness medications	27 (6.3)
Preference to talk to a friend or family member	55 (12.7)
Barriers to digital mental health (n= 432)	
Preference for face-face consultation	154 (35.6)
Do not trust online mental health care providers	81 (18.8)
Do not know where to find digital mental health care	37 (8.6)
Not comfortable using technology	13 (3.0)
Confidentiality concerns	38 (8.8)
Internet is costly	12 (2.8)

results. The reliance on self-administered questionnaires introduces biases inherent in self-reporting, particularly with sensitive mental health issues. The study design did not verify claimed mental health statuses. Consequently, it was challenging to distinguish responses based on actual mental health history, limiting the ability to draw definitive conclusions about its effects. Future research should employ more rigorous methods to authenticate respondents' mental health statuses and refine data segmentation.

Conclusion

This study found high access to and use of technology, as well as a willingness to try digital mental health interventions. Digital mental health interventions could play a vital role in increasing access to mental health care services for university students in Sudan. Awareness-raising efforts to address the attitudinal barriers and more research are needed for successful implementation in Sudan.

Competing interests: None.

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Research Article

Liver fibrosis and its associations among people with hepatitis B in rural Uganda: A retrospective records review

Ucama Ufoymungu Patrick,[1] Obwoya Paul Stephen,[1] Rose Muhindo,[1] and Boniface Amanee Elias Lumori[1,2]

Authors Affiliations:
1. Department of Internal Medicine, Mbarara University of Science and Technology, Mbarara, Uganda.
2. Department of Internal Medicine, University of Juba, Juba, South Sudan.

Correspondence:
Ucama Ufoymungu
ucmpatrick@gmail.com

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ABSTRACT

Introduction: Chronic hepatitis B affects about 240 million people worldwide, with significant complications including liver fibrosis and hepatocellular carcinoma. We aimed to study the prevalence of liver fibrosis and its associations among people with hepatitis B at Mbarara Regional Referral Hospital (MRRH).

Method: This study was a retrospective review of cross-sectionally collected data in an integrated hospital management system from July 2018 to August 2021 at MRRH. Socio-demographics, co-morbidities, and laboratory parameters were retrieved. Liver fibrosis was defined by an aspartate aminotransferase-to-platelet index score of >2. A bivariable and multivariable logistic regression analysis was used to identify factors associated with liver fibrosis. Associations in the multivariate model with a p-value ≤0.05 were considered statistically significant.

Results: Five hundred and thirty-seven records of hepatitis B patients were retrieved. The median age was 34 (Interquartile Range (IQR), 28-43) years, and 334 (62.2%) were males. One hundred and two (18.99 %) were alcohol consumers, and 189 (35.20 %) were cigarette smokers at the data collection time. The prevalence of liver fibrosis was 10.8% (CI: 8.4–13.7). Hepatitis B viral load ≥ 20,000 IU/ml (AOR: 3.58; 95% CI:1.2-1.1; p<0.016) and cigarette smokers (AOR: 5.33; 95% CI:1.4-19.9; p<0.013) were independently associated with liver fibrosis.

Conclusion: At our clinic, one in ten people with hepatitis B infection has liver fibrosis. We recommend regular screening of liver fibrosis in all people with hepatitis B, especially those with a viral load ≥20,000 IU/ml and cigarette smokers. Liver screening by a FibroScan in the hepatitis B prevalent areas of resource-limited settings may improve the detection rate.

Keywords: liver fibrosis, hepatitis B, Aspartate aminotransferase-to-platelet ratio index, Uganda

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Introduction

Globally, there are an estimated 240 million persons chronically infected with hepatitis B virus, particularly in developing countries.[1] Between 20% and 30% of those with chronic hepatitis B (CHB) develop cirrhosis and hepatocellular carcinoma. More than 640,000 people die annually from chronic hepatitis B.[1] The majority of people are unaware of their hepatitis B virus (HBV) status and, therefore, often present with advanced disease. [1] CHB is endemic in Uganda, and its prevalence is estimated at 4.6%.[2]

About 90% of people who acquire HBV at birth develop CHB. In comparison, only 5-10% of those who acquire the infection after five years progress to CHB.[3] Liver fibrosis is a known complication of a CHB that develops due to a chronic wound-healing response characterized by progressive accumulation of fibrillar extracellular matrix in the liver parenchyma.[4] If untreated, liver fibrosis develops into cirrhosis, leading to liver failure and death.[4]

Aspartate aminotransferase (AST)-to-platelet ratio index (APRI) is a recommended non-invasive test to assess the presence of liver fibrosis in resource-limited settings and has been validated for diagnosing significant fibrosis and cirrhosis.[1] Despite this, there are limited data on the prevalence of liver fibrosis in rural Uganda. In our setting, chronic liver disease is among the most common causes of death, according to the mortality audit 2020 (unpublished). Therefore, we studied the prevalence of liver fibrosis and its associations among people with hepatitis B at Mbarara Regional Referral Hospital (MRRH).

Method

Study setting and data source

The data were collected and stored between July 2018 and August 2021 in the integrated hospital management system (HMIS), an electronic system that captures the medical data for patients attending MRRH's hepatitis clinic.

Study design, population, and eligibility criteria

The study was a retrospective record review of people with hepatitis B attending the MRRH hepatitis clinic. Data of people aged 18 years or more with a positive hepatitis B record were abstracted. Records missing AST or platelets were excluded from this study.

Study variables

The dependent variable was liver fibrosis, indirectly measured by the APRI score. The formula (AST/upper limit of normal of ASTx100)/ platelet count (109/L) determined the APRI score. An APRI score>2 signifies the presence of liver fibrosis. The sensitivity and specificity of the APRI score are 52% and 85%, respectively.[5] The independent variables include age described by median (IQR), sex as female or male, alcohol consumption (as

Table 1. Baseline characteristics

Characteristic	N=537
Male sex, n (%)	334 (62.20 %)
Age, median (IQR)	34 (28 - 43)
HIV positive, n (%)	63 (11.73 %)
HIV positive on ART, n (%)	38 (60.31%)
People on hepatitis B treatment, n (%)	103 (19.18 %)
Hepatitis C status, n (%)	
Negative	429 (79.89 %)
Positive	9 (1.68 %)
Missing	99 (18.44 %)
History of smoking, n (%)	
Never	234 (43.58 %)
Current	189 (35.20 %)
Former	43 (8.01 %)
Missing	71 (13.22 %)
History of alcohol intake, n (%)	
Never	333 (62.01 %)
Current	102 (18.99 %)
Former	31 (5.77 %)
Missing	71 (13.22 %)
History of diabetes mellitus, n (%)	
No	408 (75.98 %)
Yes	58 (10.80 %)
Missing	71 (13.22 %)
Viral load for hepatitis B, n (%)	
< 20,000 IU/ml	151 (22.53 %)
≥ 20,000 IU/ml	58 (10.80 %)
Missing	358 (66.67 %)

Table 2. Factors associated with liver fibrosis

Variable	Bi-variable Analysis		Multi-variable Analysis	
	OR (95% CI)	P-value	AOR (95% CI)	P-value
Male gender	1.75(0.96 – 3.21)	0.067	1.75(0.60-5.40)	0.284
HIV positive	1.19 (0.49-2.90)	0.693		
Hepatitis C positive	4.06(0.98-16.78)	0.053		
*Smoking history	5.09(2.49-10.41)	0.001	5.33(1.43-19.92)	0.013
**Alcohol history	1.60(0.88-2.92)	0.118	1.14(0.39-3.33)	0.800
History of diabetes mellitus	1.51(0.69-3.30)	0.291		
Hepatitis B viral load (≥20,000 i.u/L)	3.53 (1.45-8.54)	0.005	3.58 (1.26-10.12)	0.016

Note: **OR:** *Odds ratio,* **CI:** *Confidence Interval,* **AOR:** *Adjusted odds ratio. *Smoking history represents both current and former smokers combined. **Alcohol history represents both current and former alcohol consumers combined.*

current, former, never, or missing), cigarette smoking (as current, former, never, or missing, and smoking), and diabetes mellitus (as yes, no, or missing). HIV coinfection was categorized as yes, no, or missing, hepatitis C coinfection (yes, no, or missing), and the hepatitis viral load was categorized as ≥20,000 iu/L or <20,000 iu/L.

Statistical analysis

After ethical approval was sought from the relevant institutions, the abstracted data was exported to STATA version 14 for analysis. Means, medians, and frequencies were used to describe the baseline variables. The prevalence was determined as the proportion of liver fibrosis patients in the study sample. Bi- and multi-variable analyses were performed to determine associations. Variables with P<0.2 in the bi-variable analysis were put into the multivariate model. A p≤0.05 was considered statistically significant.

Results

Eight hundred and fifty-one records were screened for eligibility. Of those, 299 were missing AST or platelets, and 15 had ages <18 years. Hence, 537 records were included for final analysis. The median (IQR) age was 34(28-43), and 334(62.2%) participants were male. At the time of data collection, 102(18.9%) people were drinking alcohol 31(5.7%) and 189(35.2%) were cigarette smokers. HIV coinfection was found in 63(11.7%), hepatitis C in 9(1.6%), and viral load ≥20,000 i.u/L in 58(10.8%) (Table 1).

The prevalence of liver fibrosis was 10.8% (CI 8.44–13.73), with a standard error of 1.34 %. In the bi-variable analysis, male sex, viral load ≥20,000 i.u/L, and smoking cigarettes were associated with liver fibrosis. However, in the adjusted model, smoking cigarettes and a viral load ≥20,000 i.u/L remained significantly associated with liver fibrosis (Table 2).

Discussion

Our study aimed to provide insights into the prevalence and factors associated with liver fibrosis among patients with hepatitis B infection at MRRH.

We found that the prevalence of liver fibrosis was 10.8% among hepatitis B patients. Similar findings were found by Ramirez-Mena (2016) at Saint Francis Referral Hospital (Tanzania) and Laing (2019) at St. Mary's Hospital Lacor (Uganda), with a prevalence of 9.2% and 8%, respectively. Both studies used the APRI score with a threshold of >2 as the diagnostic method for liver fibrosis.[6, 7] However, a low prevalence of 4.3% was found when using an APRI score >2 in a study conducted at two health centres in Maputo City and Mozambique.[8] This variation may be attributed to genotype distribution, as most participants in the Chambal (2017) study were found to have genotype A. In contrast, a study conducted at St. Paul's Hospital Millennium Medical College (Ethiopia) reported a higher prevalence of 17.3% using transient elastography.[9] This difference might be attributed to our use of the APRI score, potentially explaining the reduced prevalence rates observed in our findings. Though fibroscan has the highest sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) compared to APRI and FIB-4 scores, Moosavy SH et al. (2023) concluded that APRI has >90% PPV and NPV and could reliably be used in settings with no fibroscans.[10]

Our study found that a high viral load (≥20,000 IU/ml) was associated with liver fibrosis. Similar results were found in two studies conducted in Gambia and Egypt.[11, 12] This association is likely due to the replicative HBV infection, which stimulates host immune responses, leading to the chronic destruction and regeneration of hepatocytes. This process contributes to the development of fibrosis and, eventually, cirrhosis.[13]

In our study, we found that smoking was associated with liver cirrhosis. Prior studies in France and Denmark reported similar findings.[14,15] Among other mechanisms, the cytotoxic chemicals in tobacco smoke induce fibrosis by activating the hepatic stellate cells.[15]

Despite many advantages of our study, our database lacked important variables such as alanine aminotransferase. This made it impossible to compare APRI and Fib-4, another low-cost score commonly used in resource-limited settings.

Conclusion

In the hepatitis clinic at MRRH, one in ten people with hepatitis B has liver fibrosis. Where available, we recommend using a FibroScan to screen for liver fibrosis in people with CHB. All people with hepatitis B infection are advised to refrain from smoking.

Conflicts of interest: None.

Sources of funding: None.

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Approaches to Vitamin A supplementation in Eastern and Southern Africa

Learning report

Highlights

Only 24 per cent of children aged 6-23 months in Eastern and Southern Africa (ESA) receive a diet with minimum dietary diversity (MDD) and only 14 per cent receive a minimum acceptable diet. Poor diets lead to micronutrient deficiencies including Vitamin A deficiency which is a major contributor to deaths from diarrhoea and measles and a major cause of preventable childhood blindness.

Until poor diets are addressed, vitamin A supplementation remains a necessary, life-saving intervention that reduces child morbidity and mortality. However, less than two thirds of children aged 6-59 months in the region currently receive adequate vitamin A supplementation.

This report summarizes the different approaches currently being used across the 21 countries in the region, the strengths and weaknesses of each, and provides considerations for how governments, partners and donors can move forward to reach more children with this critical intervention.

From:

https://www.unicef.org/esa/reports/approaches-vitamin-supplementation-eastern-and-southern-africa?utm_campaign=WINS%20%7C%20Approached%20to%20Vitamin%20A%20Supplementation%20in%20ESARO%20(Partners)&utm_medium=email&utm_source=Mailjet

Review Article

From affection to infection: Understanding the risks of kissing infants: A review

Husam Hussein Lazim

Author Affiliation:
Ibn Sina University of Medical and Pharmaceutical Sciences, Baghdad, Iraq

Correspondence:
Husam Hussein Lazim
hlazim@ibnsina.edu.iq

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ABSTRACT

Although it's a typical and loving gesture, kissing newborns carries a considerable danger because it could spread infections. Due to immature immune systems and incomplete vaccination histories, newborns are especially susceptible to respiratory viruses like influenza and respiratory syncytial virus (RSV), bacterial pathogens like Streptococcus pneumoniae and Group A Streptococcus, and cytomegalovirus (CMV). Despite the risks, many parents and other caretakers are ignorant of them and frequently permit intimate contact with guests who might be unintentionally carriers of infectious pathogens. This overview looks at the several infections that can spread by kissing, the possible effects on a newborn's health, and the precautions experts advise taking to reduce the dangers.

Keywords: kissing, infants, pathogens, risks, microbes.

Introduction

Kissing a child by a close relative, especially a parent, is an instinct and part of the bonding process. The transmission of pathogens to newborn babies through kissing is significant due to their developing immune systems. Kissing newborn babies may pose a significant risk to their health. Many parents are unaware of this and the potential consequences for newborns.[1] The following are some of the important pathogens that may be encountered.

Herpes simplex virus 1

If a person kissing a child has active Herpes simplex virus type 1 (HSV-1) anywhere on the skin, especially on the lips (cold sores), there is a significant risk of transmission.[2]However, it must be appreciated that individuals may be asymptomatic carriers of the virus and still transmit it.

Cytomegalovirus (CMV)

CMV is also a member of the herpes family of viruses. Most people are infected at some stage, with the virus remaining latent but still transmissible. Transmission may occur with contact with any body fluid, including saliva, via kissing and urine.[3] The clinical features in a child range from mild (flu-like symptoms including fever, cough, and sore throat) to severe, especially in newborns who may develop encephalitis and/or a hearing deficit.[4]

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Respiratory Syncytial Virus (RSV)

RSV is very contagious, and most children have been infected by the age of two years. The features resemble a common cold: runny nose, cough, and mild fever. It may be transferred by physical touch, including kissing, and through droplets released by coughing and sneezing. It can also survive on surfaces (e.g., toys) for several hours. Premature infants, babies under six months old, and especially those with compromised immune systems, are most vulnerable to the severe consequences of RSV infections and bronchiolitis.[5,6] A vaccination against RSV is available.

Influenza virus

This respiratory virus is easily transmitted from respiratory secretions and droplets, such as coughing, and especially during the active phase of an infection. Infants are more vulnerable to serious influenza-related illnesses because of their immature immune systems and lack of previous immunity.[7] Childhood features include cough, sore throat, and fever with poor feeding.

Varicella-Zoster Virus (VZV)

This is another herpes virus that causes chickenpox and remains dormant in the nerve ganglia. Under certain circumstances, the older person or immunocompromised (especially with HIV) may reawaken and cause shingles. Infection may be transmitted through saliva and droplets and from the blisters of shingles. Hence, the virus may pass to a young child from all of these sources.[8] However, shingles are rare in children, but chickenpox is common. It may become serious if the latter occurs in the first year of life.

Epstein-Barr virus (EBV)

This is yet another herpes virus and one of the most common worldwide. It is sometimes called the "kissing virus" and is easily transmitted by body fluids, especially saliva. EBV commonly occurs in children: usually, it is a mild illness, similar to a common cold or mild influenza, and resolves spontaneously. Rarely, there are serious sequelae, including meningitis and encephalitis.[9]

Human papilloma virus (HPV)

This has over 100 variants and should not be confused with the herpes simplex virus. It is usually a sexually transmitted infection but can affect children. Kissing is thought to provide a lower risk of HPV infection than more intensive physical contact, including hand-to-hand contact, during sexual activities. Still, it is acknowledged as a possible mode of transmission, nevertheless.[9] Family members can become hetero-inoculated via kissing and other non-sexual interactions.[10] The manifestations among infants include condyloma acuminatum, genital warts, and mouth lesions.

Human metapneumovirus (hMPV)

Close contact with an infected person, such as kissing, touching, or shaking hands, is the primary way that hMPV is transmitted between infected people. Most children who acquire the infection are aged under five years. The symptoms are cold-like and usually last no more than five days. However, a child under the age of twelve months is at risk of serious respiratory problems.[11]

Streptococcus pneumoniae

This bacterium is a common cause of pneumonia and meningitis in children under five years, especially in newborns, because of their immature immune systems. It can be spread through direct contact, including kissing and saliva droplets.[12]

Streptococcus pyogenes

Asymptomatic carriage of Streptococcus pyogenes in the pharynx and on the skin is common. Transmission by kissing, sneezing, or coughing may occur from one person to another. Infection is more common in newborns because of their immature immune systems. It can result in meningitis, pneumonia, or sepsis, among other dangerous illnesses.[13]

Staphylococcus aureus

Transmission of this bacterium usually happens through direct contact with contaminated skin or surfaces rather than by kissing. Asymptomatic carriage is common. Due to their underdeveloped immune systems, newborns are more susceptible to S. aureus infections.[14] Consequences of infection include impetigo and scalded skin syndrome, as well as more severe manifestations such as pneumonia.

Haemophilus influenzae

Newborns can contract Haemophilus influenzae from respiratory droplets and by kissing. Asymptomatic carriers may also transmit this bacterium.[15] The ears, eyes, and sinuses are most commonly infected. Meningitis is a feared consequence with a high mortality rate.

Conclusion

The act of kissing newborns and infants, especially those under five years old, carries a risk of transmitting a variety of pathogens. This brief review has highlighted that pathogens such as herpes, RSV, influenza, and various bacteria can be transmitted through saliva and respiratory droplets exchanged during kissing and close contact. Awareness among parents, caregivers, and the general public about these risks is crucial for protecting newborns, especially during their early months of life when their immune systems are still developing. Simple measures like frequent handwashing, avoiding close contact when sick, and refraining from kissing newborns on the face or lips can significantly reduce the likelihood of transmission. Healthcare providers play an important role in educating families about these precautions. Research should continue to explore effective communication strategies and interventions to promote safe practices around newborns and reduce the incidence of preventable infections transmitted through close contact.

There is a mnemonic that may help prevent the transmission of infection to babies: ***THANKS***, i.e. **T**hink**H**ands **A**nd **N**o **K**isses.

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Review Article

A review of one year malaria blood film data from a hospital in Yei, South Sudan

Kennedy Obonyoh[1], Agnes James[1] and J. Clarke McIntosh[2]

Authors Affiliations:
1. His House of Hope and Faith Hospital, Yei, South Sudan.
2. Mary Immaculate Hospital, Mapuordit, South Sudan.

Correspondence:
Clarke McIntosh
jclarkemcintosh@gmail.com

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ABSTRACT

Although Rapid Diagnostic Tests (RDTs) are utilized more frequently today, blood films are still the gold standard for diagnosing malaria. This is an observational study, looking at the experience of His House of Hope and Faith Hospital (HHHF) in Yei, South Sudan, in one calendar year (January to December in 2023) tracking *Plasmodium falciparum (PF)* and other plasmodium species. We report some simultaneous data using RDT for malaria and data regarding co-infection with *Salmonella typhi* (Typhoid fever).

Keywords: malaria, blood film, Rapid Diagnostic Test, South Sudan

Introduction

Malaria is one of the most common diagnoses in sub-Saharan Africa, particularly in South Sudan. Data from WHO suggests there are 100-300 cases/1000 people per year,[1] equivalent to one case in 3-4 people. This means that South Sudan is one of the countries most heavily affected globally, but that may be an underestimation. Over 90% of the Hospital staff are often infected every year, many of them multiple times (personal observation). This is an observational report of the number of malaria-positive blood films performed in a calendar year at His House of Hope and Faith Hospital (HHHF), Yei, South Sudan.

Method

Thick and thin blood films were performed by the HHHF laboratory staff under the supervision of KO and AJ when requested by the hospital clinicians. A blood slide is prepared from a finger prick with thick and thin smears on the same slide as follows:

1. The ring finger is cleaned with an alcohol swab, dried, and pricked using a blood lancet.
2. A small drop of blood, approximately six microlitres, is applied to a clean glass slide for the thick film and similarly, approximately two microlitres for the thin film, which is spread using another clean glass slide positioned at 30 to 45 degrees to allow the blood to run along the plane. Pushing gently, the thin smear is created and should be V-shaped with feathered ends. Using the same spreader, six microlitres of blood are gently mixed in a circular motion,

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starting from inside, going outwards, and then to the centre. A good thick smear is round.

3. The smear is air-dried for five minutes. The thin smear is fixed using absolute methanol.

The thick and thin smears are then heat-fixed for at least 2 to 3 minutes. The slides are allowed to cool. They are stained using 10% Giemsa stain solution, rinsed in water, and dried for microscopic examination. At least 200 microscope views under oil immersion are examined before a slide is declared negative for malarial parasites. Both asexual and sexual parasites are counted as positive. We also check for different malarial species. The parasites are designated either *Plasmodium falciparum* (PF) or "other" Plasmodium species for this reporting.

Rapid Diagnostic Tests (RDTs) for malaria are performed either by the laboratory or the clinician using Abbott RDT for PF and other plasmodium species. KO or AJ performed an RDT test for *Salmonella typhi* IgM from Parl Care Accurate.

Results

As indicated in Figure 1, the number of blood films for malaria requested by HHHF hospital clinicians varied throughout the year. The lowest number of tests ordered was in December and was 49% of the number requested in June. The number of positive slides also showed some variation - with those positive for PF in December being 49% of the highest number in July. Over 84% of the blood films were positive for either PF or another plasmodium species from May to August. 75% of the blood films were

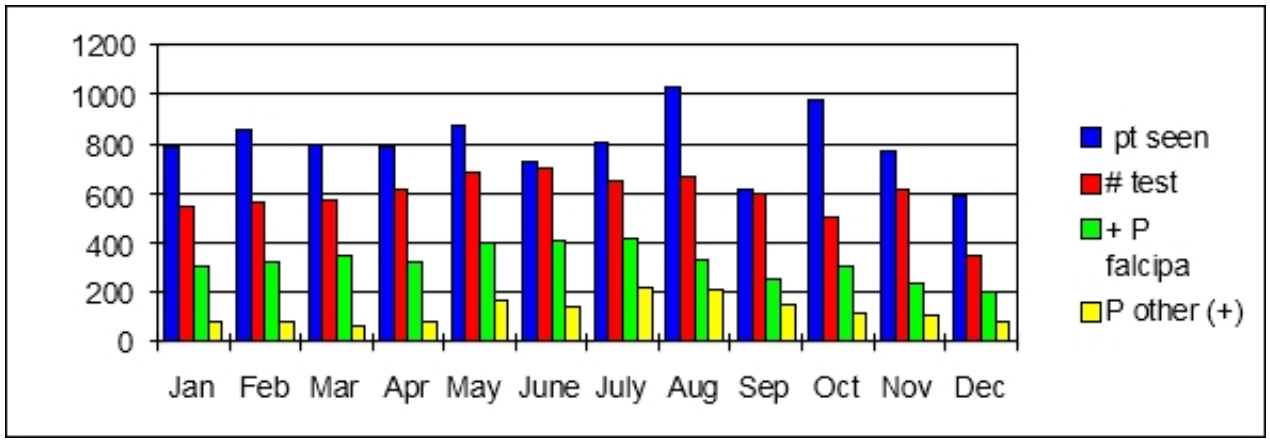

Figure 1. Blue columns represent the total number of patients seen that month. The red columns are the number of patients tested for malaria using blood film. The green columns are the number of blood films (+) for PF. The yellow columns are the number of blood films (+) for other plasmodia species.

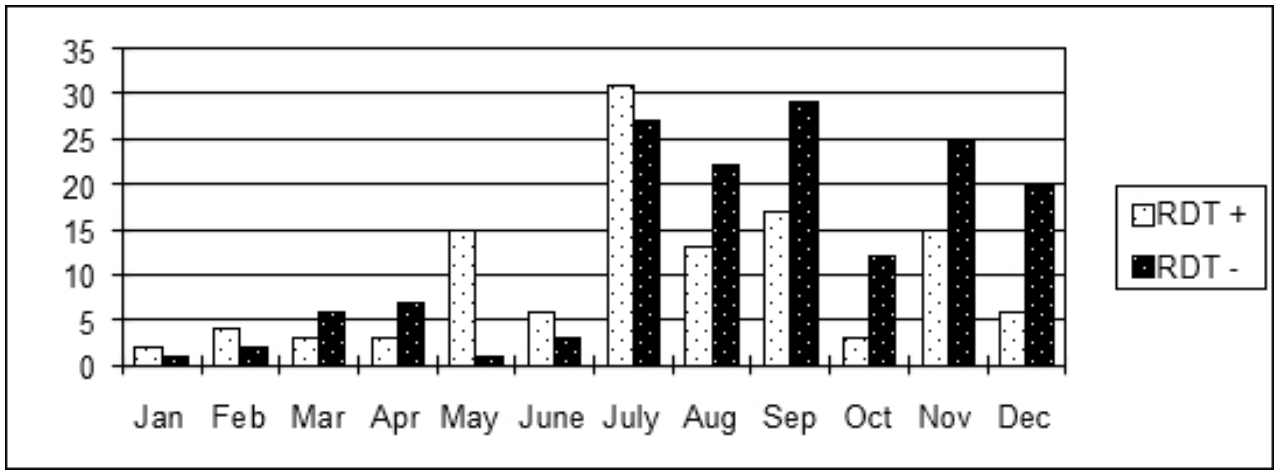

Figure 2. The white columns are the number of Rapid Diagnostic Tests for malaria that were (+). The black columns are the negative tests

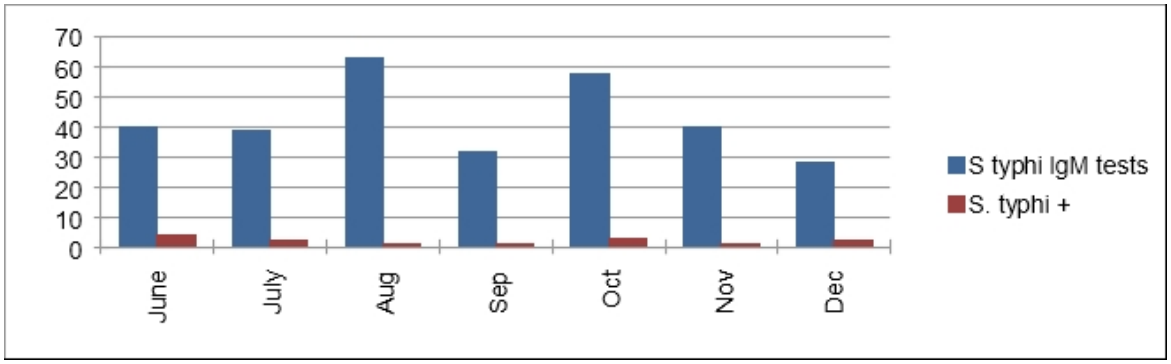

Figure 3. The blue column represents the total number of tests for S. typhi IgM. The red columns represent the number of (+) tests.

positive for PF or another species. RDTs were performed much less often than blood films and were positive at a lower percentage. From May to August, 60% of the RDTs were positive compared to 84% of blood films. Only 44% of the RDTs were positive for the year, whereas 75% of the blood films were positive (see Figure 2).

Three hundred *Salmonella typhi* (S typhi) IgM tests were performed over a seven-month period on patients suspected of having typhoid fever, but only 14 (4.7%) were positive. See Figure 3. Most of these tests were performed on patients who were also tested for malaria.

Discussion

Malaria was the most common diagnosis in our outpatient clinic during the calendar year 2023 and reflects the experience in most of South Sudan. However, Yei is in the southernmost part of South Sudan; hence, the seasonal patterns observed there are not the same as in the remainder of the country. As expected, *Plasmodium falciparum* (PF) was the most common malaria parasite, but other species were also found in a significant quantity (see Figure 1), as has been reported from Zambia.[1] There was a rise in cases seen during the rainy season, with the highest numbers of malaria confirmations from May to August. Though the number of tests ordered in August and September were similar (95%), the positive number in September was only 57% of those in August. There was a slight decline from September to December compared to the earlier months.

One interesting observation was the very low IgM-positive tests for *Salmonella typhi* obtained during the latter half of this period. From June to December, the number of malaria cases was high (2,253), but the number of confirmed cases of *S. typhi* was low (14). Many people in South Sudan speak of "malaria-typhoid" as though the two diseases have a special relationship, a synergistic effect, or that one predisposes to the other, as HIV does for TB. One study that suggested a strong relationship between the two diseases relied on the Widal test.[3] Studies examining more specific tests for *S. typhi* have shown modest to no association.[4,5] Using blood film or RDT, malaria is a common diagnosis in South Sudan and sub-Saharan Africa, but typhoid fever is more of an Asian disease. In confirmed cases of typhoid fever using specific data (cultures or IgM antibodies), 75-80% are in Asia.[4]

Our data suggest that if there is an association between the two diseases, it is small and probably coincidental. IgM antibodies reflect current or recent infection and are the only specific antibody test for an acute infection for any pathogen. IgG-positive antibodies reflect infection in the past. The Widal test is non-specific, even with high titres. Malaria is common as expected and will often occur with other diseases, but our data suggests that there is no special relationship between malaria and typhoid fever.[4,5]

The studies mentioned above[4,5] have also failed to show synergy between the two diseases when specific tests for *S. typhi* are employed. We suggest this presumed relationship is probably caused by the over-reliance in South Sudan on the Widal test, a non-specific test that at best helps support the diagnosis when the clinical picture strongly points to typhoid fever but should not be used to make the diagnosis without other evidence. Now that more specific tests for *S. typhi* are available, we suggest the Widal test be abandoned.

It is important to be cautious when drawing conclusions from an observational study. However, our study in Yei shows that, although there may be a "malaria season," there is no time of the year when malaria ceases to be commonly

found, especially near a river. Secondly, although PF is the most common form of malaria in South Sudan, it is not the only malaria species. This may be important to those centres that rely on Rapid Diagnostic Tests that test for PF only. A recent study from Ethiopia, including Sudan and South Sudan, suggests that RDTs may be missing up to 20% of cases because of some evolution of antigens in PF.[6] We do not know if that was the mechanism, but RDTs were less sensitive than blood films in our hands. We suggest that this reliance on RDTs needs to be re-examined. Thirdly, typhoid fever is not a common co-infection with malaria, and the term "malaria-typhoid" needs to be discarded. We suggest that if typhoid is suspected and whether or not there is a concomitant infection with malaria, it should be confirmed by *S. typhi* IgM antibodies, not the Widal test. From the available data, there is no justification for presumptively treating typhoid fever in all patients with malaria.

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South Sudan is facing a spiralling humanitarian crisis with hunger and cholera cases escalating in several parts of the country.

UN agencies on Friday called for more international support and interventions to ease the widespread suffering.

The UN World Food Programme (WFP), World Health Organization (WHO) and UN Children's Fund (UNICEF) have raised the alarm over worsening hunger, malnutrition, and disease outbreaks in the world's youngest nation.

WFP warned that the food situation in South Sudan has reached critical levels, with more than half of the population already facing "crisis-level" hunger - classified as at least IPC3 on the five point global food insecurity scale.

Exacerbating the situation is that the UN food agency has no funds to preposition supplies for next year, as it also faces challenges accessing communities in need due to seasonal road closures and prohibitive costs associated with airlifting aid.

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An introduction to quantitative and qualitative approaches for researchers

Stephen Hyer

Consultant Endocrinologist, Epsom & St Helier University Hospitals NHS Trust and Clinical Professor, American University of the Caribbean

Correspondence:
Stephen Hyer
Steve.hyer@nhs.net

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ABSTRACT

Research is important. It adds to our knowledge base, improves practice, shows which practices are effective and which are not, provides evidence to inform policy debates, and helps us as health professionals become better practitioners. Findings from research are shared at scientific meetings, conferences, and in medical journals such as this one.

To be useful, research must be carried out ethically, with full disclosure of how the data were collected. The researchers must have used appropriate statistical methods to analyse their data. This is vital if we are to draw valid conclusions and potentially change practice.

This paper will discuss quantitative and qualitative approaches used in research studies. By the end of this paper, you should understand the differences between the two approaches, and which is best suited for your planned research.

Introduction

The research process (see Figure 1) typically begins when a topic or issue is identified as of sufficient importance to be worthy of study. Often, the area of interest for research is very broad, and the researcher must focus on a specific topic to study. For example, a study of *'The health of teenagers in South Sudan*' will encompass an extensive range of physical and mental illnesses. It may be better to study a particular illness of concern, such as diabetes mellitus, and focus on a setting where data may be more accessible, for example, *'Characteristics of diabetes mellitus in under 18-year-olds in Juba'.*

Research builds on existing knowledge and not merely replicates previous research. It is essential to become familiar with the literature to understand what is already known about the issue, which is the objective of the planned study. This is the rationale for performing a literature review to locate relevant publications in journals and books. Where available, librarians may assist in this work.

After a review has been completed, the researcher should refine the research question to be answerable by the study. The study of diabetes in under-18-year-olds in Juba, for example, may now be reformulated into a much more focused research study: *Changes in the incidence of type 1 diabetes amongst under-18-year-olds in Juba from 2020 -2024.* A hypothesis can be constructed which can be statistically rejected if the findings are no more likely than a chance effect.

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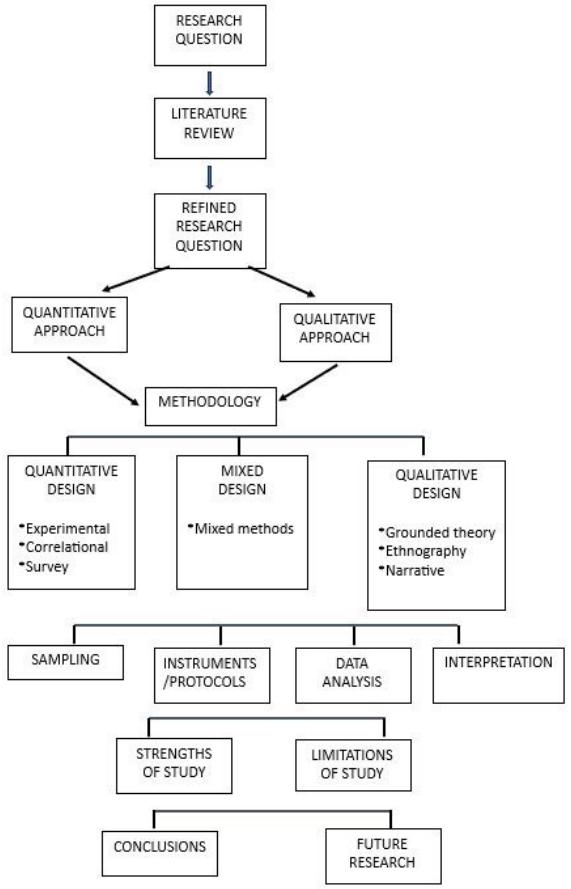

Figure 1. The Research Process

In another example, the researcher may be interested in glycaemic control among under-18-year-old patients with type 1 diabetes. In addition to quantitative measures of control, the investigators might want to explore patients' attitudes toward their condition and aspects of their behaviour.

The research question might be formulated: *Does contact with health professionals in the diabetes team based at Juba Teaching Hospital from 2022- 2023 lead to changes in behaviour and attitude to their condition in under-18-year-olds with type 1 diabetes?* The methodology, in this case, will need to assess behaviour and attitudes and compare them before and after contact with the health professionals. Again, a hypothesis can be generated, and the results analysed to determine the likelihood of any findings being due to chance.

The researcher will need to select either a quantitative or qualitative (or mixed) research approach to address the research question being studied. We will now discuss the characteristics of these approaches.

Quantitative research

Quantitative research is the process of collecting and analysing data. It is widely used to test hypotheses and causal relationships, make predictions, and find results that can be generalised to wider groups of subjects.

The quantitative research approach is used when:

- Describing the research issue that needs addressing in terms of trends or the relationship among variables,
- Creating research questions that are specific, narrow, measurable, and observable,
- Collecting numeric data from large numbers of people using well-validated instruments,
- Analysing trends, comparing groups, or relating variables using statistical analysis, and interpreting results by comparing them with prior predictions and past research,
- Writing the research report using standard evaluation criteria, taking an objective, unbiased approach.

The investigator in *quantitative* research is interested in trends or trying to understand how one variable affects another. The literature review will have identified key variables that are known to be relevant to the planned study and areas of uncertainty or where the evidence is contradictory. The tool used to measure the variable(s) of interest is important, as any limitations or inaccuracies in the measurement will affect the interpretation of the results. The number of participants in the study (the sample size) will determine the 'power' of the study and its generalisability to larger populations.

The appropriate statistical analytic tool must be selected for the study design. It is recommended to seek statistical advice *before* starting a research project to ensure the study can address the research question. The different analytic methods will be discussed more fully in the following paper in this series. In brief, raw data are first sorted and summarised using descriptive analysis. For example, mean, median, mode, range, standard deviation, quartiles, and percentiles.

Descriptive statistics simply describe the data without inferring a relation between one variable and another. Further analysis requires *inferential statistics* to make inferences from the data, such as the probability that an

observed difference between groups might have happened by chance. Statistical tools may be used to make inferences from the sample studied to a much larger population. The different statistical tools will be discussed in the following paper.

In *quantitative* research, it is essential to design studies to control variables that might introduce bias. For example, the selection of participants in a study might introduce bias. When subjects leave the study early, this can introduce bias, as those who remain may be different in important ways, which will have implications when interpreting the results. Bias also occurs when inappropriate statistical tests are used.

Study design measures to help prevent bias include using control groups, randomisation, double-blind design, and placebos. Sponsors of a research study may influence how the data is presented and, in the worst case, suppress critical evidence. Researchers must declare any conflicts of interest or financial relationships with the sponsor.

Types of quantitative research

Quantitative research produces objective data that can be analysed to identify trends and associations. In *intervention studies* (also known as experimental designs) such as clinical trials, one group receives an intervention, which is compared with a control group. Statistical analysis determines the likelihood of the results being more than just a chance effect. The results help to support or disprove the study's original hypothesis.

In a *correlational research study*, a single group of individuals may be studied to determine the relationship between variables of interest. Such studies can be prospective (longitudinal), where events are measured over time or cross-sectional at one specific point in time.

Cross-sectional studies are relatively quick to perform and are used to determine prevalence. By contrast, longitudinal studies are more likely to suggest a cause-and-effect relationship, although there is always the possibility that hidden variables account for the observed effects. For example, researchers might investigate the association between glucose levels and the development of diabetic foot ulcers in a cohort of patients with diabetes. The strength of the association can be statistically assessed, and the result is used to predict this complication more generally in larger populations of similar patients.

When no intervention is planned, no association is sought, and investigators are simply interested in trends, a *survey design* may be appropriate. A representative sample of the population of interest is surveyed to identify trends that can then be generalised to a larger group.

Quantitative research has the great advantage of objectivity. The results can be rapidly analysed and clearly communicated through statistics. However, it is unsuitable for some types of research.

However, participants cannot enlarge upon their responses or add context to explain their choices. The patient's perspective is not studied in this type of research. For example, researchers interested in finding out what it is like living with diabetes would need to adopt a *qualitative* approach to exploring their patients' experiences.

Qualitative research

Qualitative research is primarily concerned with meaning, subjectivity, and lived experience. It is exploratory and attempts to understand behaviour from the perspective of the study participant. Unlike in quantitative research, the qualitative researcher is integral to the research process, interacting with and interpreting what is being said.

Qualitative research is used when:

- Exploring a problem and developing a detailed understanding of a central phenomenon,
- Investigating research relevant to the participants' experiences,
- Collecting data based on words so that the participants' views are obtained,
- Analysing the data for description and themes using textual and thematic analysis,
- Interpreting the larger meaning of the findings takes into account the researchers' subjectivity.

Examples of qualitative research methodology include diary accounts, in-depth interviews, focus groups, and ethnography. For example, *diary* accounts give written accounts of personal experiences and reflections.

Table 1. Comparison of open-ended and closed questions

Open-ended questions	Closed-ended questions
Qualitative	Quantitative
Contextual	Data-driven
Personalised	Pre-determined and created
Exploratory	Focused

Interviews generate qualitative data using open questions (unstructured) or predetermined questions with the opportunity for the interviewer to explore responses further (semi-structured) (See Table 1). Ethnographic research is used in the social and behavioural sciences and consists of collecting data through careful observations, for example, shadowing individuals at work or living in a particular community.

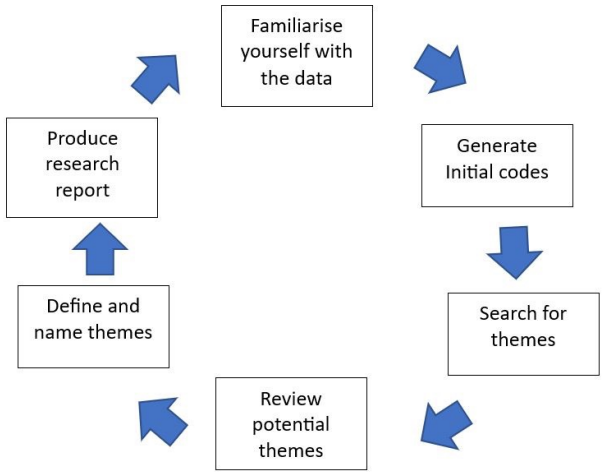

Figure 2. The continuous cycle of thematic analysis (Adapted from Clarke and Braun, 2017- see Further reading)

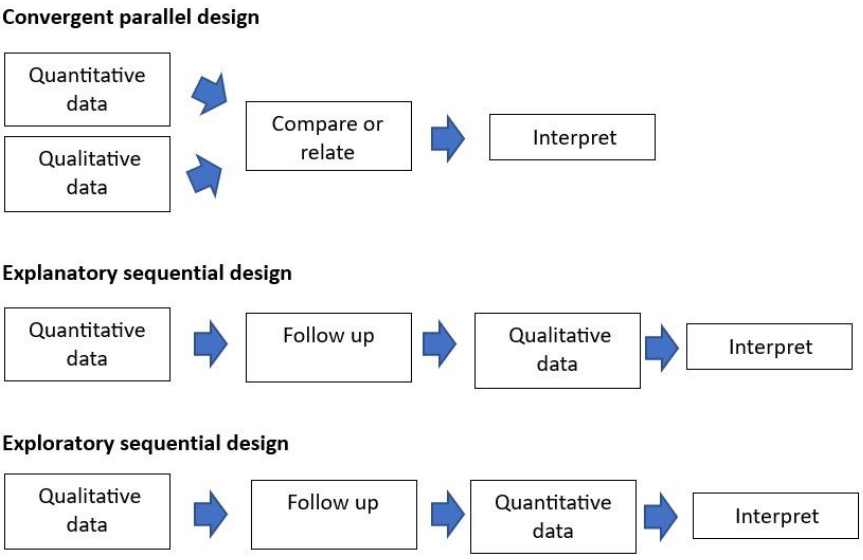

Figure 3. The mixed methods research designs

Various techniques are used to make sense of qualitative data. In thematic analysis, themes will emerge once the data has been coded. The procedure involved in *thematic analysis* is shown in Figure 2. The process starts with familiarising the data, which involves re-reading transcripts and notes and writing down initial ideas. The coding phase entails highlighting or labelling certain words or phrases in the data that will help the researcher make sense of the data. From these codes, themes are derived and reviewed to ensure they cover all the qualitative data.

Themes can be modified depending on how well they fit the data. Once defined, themes can be named, and the researcher can produce a summary report that attempts to interpret the data and draw inferences from it.

Grounded theory methodology collects empirical data, such as interviews or observations of participants. From the transcripts, the researcher looks for themes from which a theory can be derived that is 'grounded' in the results. This methodology is not used to test a hypothesis but rather to generate one.

Content analysis is another technique used in qualitative research to quantify and analyse the presence and relationships of words, themes, or concepts within textual data. The researcher can then make inferences about the messages within the text and what this means for the intended audience. This type of analysis can also be applied to transcripts from interviews.

Mixed methods research

In some study designs, the researcher will collect both qualitative and quantitative data at the same time. For example, a study investigating diabetes care in a particular setting, such as a nursing home, might collect quantitative data, namely glucose readings, HbA1c levels, and frequency of hypoglycaemic episodes, as well as data from qualitative interviews with the residents. This gives a more comprehensive understanding than either method alone. The two approaches need to be integrated to achieve more significant insights, and this process of integration can take place during

data collection, analysis, or the presentation of the results.

The different *mixed methods research designs* are shown in Figure 3. The researcher will need to consider whether to prioritise quantitative or qualitative data for their study (or whether they are both of equal weight) and plan the sequence of data collection:

- Where the study seeks to explain or elaborate on quantitative results (explanatory design), the explanatory sequential design is used.
- By contrast, a study that aims to develop an instrument or tool from qualitative data will use the sequential exploratory design.

Summary

While qualitative and quantitative research approaches are different, they should be considered complementary rather than competing against each other. Qualitative research can help generate theories or models of care that can be tested by quantitative methodology. They are certainly not mutually exclusive, and a mixed methods approach can help deepen understanding of quantitative results.

Both qualitative and quantitative research help healthcare professionals understand the impact and challenges of the care they provide. All health care team members should be encouraged to participate in research.

In the following paper, we will consider basic statistical methods used for data analysis (see page 207)

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Basic statistical methods in research and their interpretation

Stephen Hyer and Jyoti Balani

Epsom & St Helier University Hospitals NHS Trust

Correspondence:
Stephen Hyer
Steve.hyer@nhs.net

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ABSTRACT

Whether quantitative or qualitative, research generates data that requires analysis and interpretation to derive insights. Statistical tests allow researchers to calculate how much the relationship between the variables they have investigated differs from that which might be expected by chance alone. In statistical terms, whether the null hypothesis of no significant relationship is accepted or rejected. This article will consider the common types of statistical tests applied to quantitative research data and their interpretation. By the end of this paper, readers should be better informed about the choice of statistical test for their research study and how to interpret the results.

Introduction

Statistical significance

The null hypothesis for statistical tests simply states that no significant association exists between the variables under consideration. We then employ statistical methods to *support* the null hypothesis, i.e., the findings are no more likely to occur than pure chance, or to *reject* it, i.e., the findings are unlikely to be due to chance.

A *p-value* measures the probability of obtaining the observed results, assuming that the collected data meet the null hypothesis expectation, i.e., there is no effect or relation between the variables. The level of statistical significance is expressed as a *p-value* between 0 and 1. The significance level is conventionally set at 0.05, meaning there is a 5% chance of the result occurring if the variables are not associated. Thus, a *p-value* <0.05 obtained after analysing the research data is statistically significant and unlikely to be a purely random (chance) occurrence. The closer the *p-value* to zero, the less likely it is to have occurred by chance. For a *p* of 0.001, there is a one in one thousand chance; for a *p* of 0.045, the chance is one in twenty-two. Values that round to 0.000 should be reported as <0.001, as they can never be zero.

A statistically significant result says nothing more than that there is an association between the variables. It does not imply a causal relationship.

It is important to recognise that a statistically significant result may, nevertheless, not be clinically significant. A large study can detect small, clinically unimportant findings that are statistically significant. P values are subject to several influences. Lower p-values are found in larger sample sizes when there is a greater spread of observations with large standard deviations and when the measured effect observed in interventions is very significant.

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Choosing the correct statistical test (numerical data)

Selecting the right statistical test is often left until after the data has been collected and the study is completed. In fact, the appropriate statistical test should be considered when planning a research study so that the study is adequately powered to accept or reject a hypothesis. This has important implications, for example, for the study sample size. In more complex studies, it's best to get advice from a statistician *before* starting the study. Indeed, to register a clinical trial, a statistical analysis plan is required.

A few basic considerations will help in selecting the correct statistical test, and these will be outlined below.

Q1. What types of data are being measured?

Raw data consists of variables or data items; the variable type is important when selecting the appropriate statistical test. *Numerical quantitative* variables (quantities) may be *continuous,* e.g., weight, height, or *discrete,* i.e., limited numbers in a defined collection, e.g., number of siblings. *Categorical* variables are values that are grouped together based on a particular characteristic or attribute, e.g., age group, sex, or educational level. Categorical variables that can be ordered or ranked are referred to as *ordinal* variables, such as the Likert scale of satisfaction rating (extreme dislike, dislike, neutral, like, extreme like). Categorical variables such as region, the categories of which have no obvious order or rank, are called nominal variables. Binary variables are categorical variables with exactly two categories, often yes and no, usually represented by 1 and 0.

Q2. Are the data paired or unpaired?

Consider a researcher undertaking a prospective study of a cohort of patients, making observations on them at two-time points (at the beginning and end of the study). For each individual, there will be two observations (*paired* data). Another study surveys a group with pre- and post-treatment samples, again producing paired data. In a further study, a researcher may compare observations at one point in time in one group of patients with a matched control group. Here, there will be *matched* data, which can also be considered paired.

It is important to determine if the data are paired or independent, as applying the wrong statistical test will give very different results. Independent, unpaired data collected from different populations can give valuable insights into baseline differences between them, which

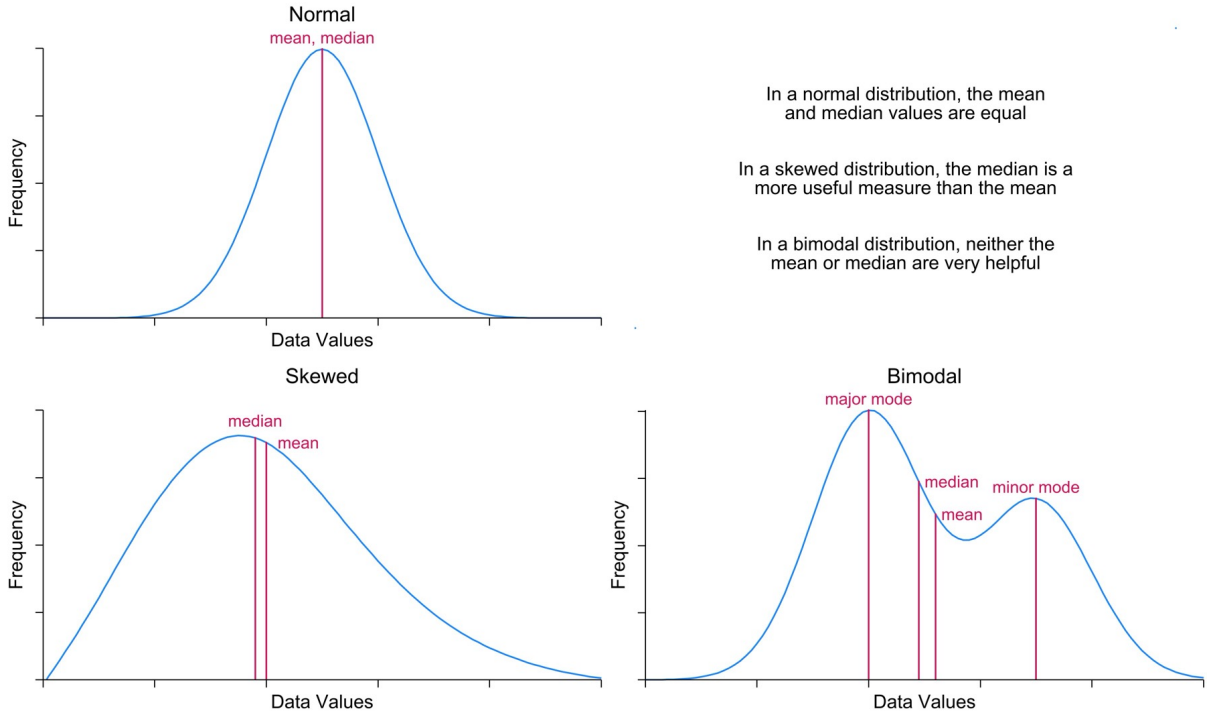

Figure 1. Normal and non-normal distributions

can then be generalised. However, paired data in the same population are much more likely to give insight into the effects of a specific treatment or intervention. There are likely to be many other (unmeasured) factors when comparing two unrelated and unmatched populations.

Consider a study that compares results from two different populations that are not related in any significant way. The researcher wants to compare the differences between the two groups. The data will be independent (unpaired). Alternatively, another study comparing results from men versus women (unpaired). Unpaired samples also include a study in the same population when comparing results taken at different times.

Q3. Are the values of the outcome measure of the study in a normal (parametric) distribution or non-parametric?

The term *normal* distribution was introduced in the 19th century when it was believed that many natural phenomena, such as height, were distributed in a symmetrical 'bell-shaped' curve around the mean value. It can also be termed a *Gaussian* distribution (Figure 1). Statistical tests that assume the data are normally distributed are termed *parametric* tests, in contrast to *non-parametric* tests, where this is not assumed.

Parametric tests are applied when it can be assumed that the data of interest are at least approximately normally distributed. Depending on whether the data are paired or independent, the means of two groups can be compared using paired t-test or unpaired t-test. If there are more than two groups, the means can be compared by Analysis of Variance (ANOVA). A more sophisticated test, MANOVA (Multivariate Analysis of Variance), analyses multiple dependent variables.

Non-parametric statistical tests do not make any assumptions about the data distribution and are used, for example, where the data are likely to be skewed. The Mann-Whitney U test (also called the Wilcoxon rank sum test) is suitable for comparing two unpaired datasets and can also be used for paired data. If there are more than two sets, the Kruskal-Wallis test is employed.

A simple decision algorithm numerical outcome measures is shown in Table 1.

Table 1. Decision algorithm for numerical data

Distribution?	Paired?	Groups	Test
Normal	Yes	2	Paired *t*
		>2	Repeated measure ANOVA
	No	2	Unpaired *t*
		>2	One/multiple way ANOVA
Non-normal	Yes	2	Wilcoxon signed-rank
		>2	Friedman
	No	2	Mann-Whitney U
		>2	Kruskal-Wallis

Table 2. Relationship between duration of breastfeeding and partner occupation (invented data)

		Breast fed		
		<3 months	≥3 months	**Total**
Partner occupation	Doctor	36	14	**50**
	Farmer	30	25	**55**
	Total	**66**	**39**	**105**
			Chi-squared	3.418
			Probability	0.065

Chi-squared test to compare two categorical variables

The Chi-squared test is a commonly used test to determine whether observed data are significantly different from what would be expected if there were no association between the variables. It tests categorical data, which are usually displayed in a frequency distribution table (contingency table; Table 2). Note that the table contains actual numbers of occurrences and not percentages, means, proportions, or other calculated numbers.

Consider researchers interested in the length of breast-feeding (less than 3 months versus 3 months or more) comparing doctors' wives with farmers' wives; the null hypothesis being that there is no difference.

The chi-squared statistic measures the extent to which the observed values in the table differ from the expected values (the values if there were no association between the variables). The chi-squared probability tells us the probability of the observed values occurring under the null hypothesis of no association. Since 0.065 is greater than 0.050, we cannot reject the null hypothesis. The probability depends not only on the value of the chi-squared statistic but on the number of rows and columns in the table. This test should only be used if all of the expected table cell values are greater than one and 80% of the expected values are greater than five. Rows or columns can usually be combined to meet this requirement, or Fisher's exact test can be used instead. For neither test should "no answer" categories be included.

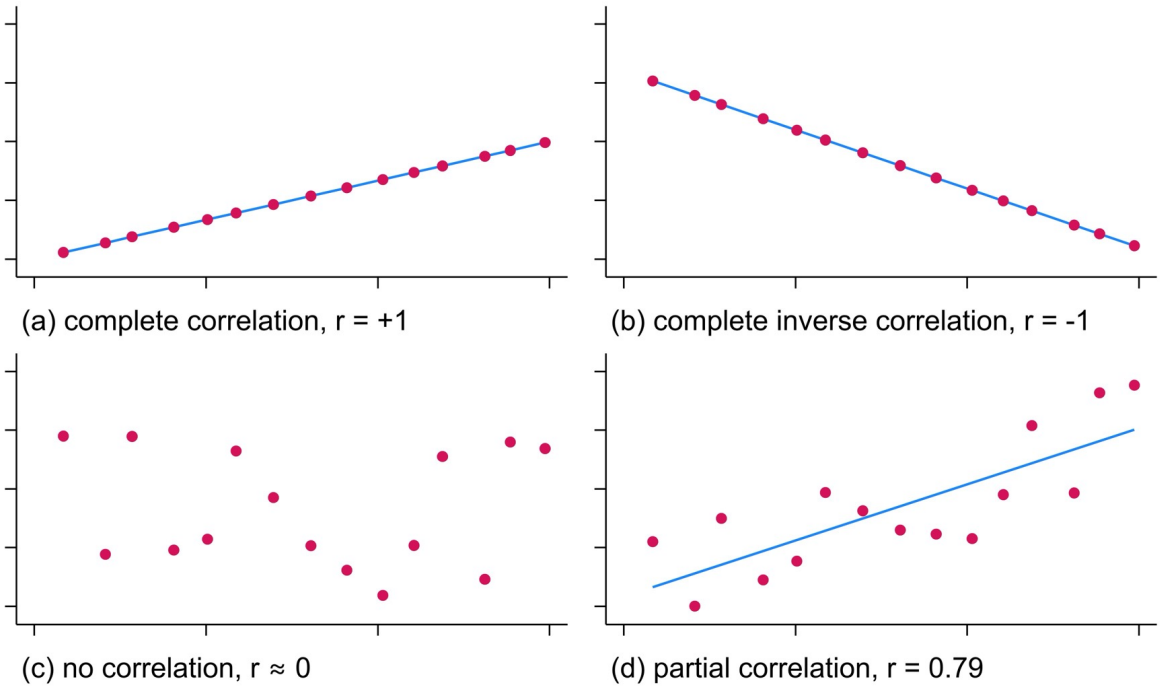

Figure 2. Illustration of different correlation coefficients. X axis independent variable, Y axis dependent variable

Regression analysis

In regression analysis, we are trying to quantify the relationship between a dependent variable (the variable you want to analyse) and at least one independent variable, the explanatory variable. This can be used to predict the extent to which changes in one variable will affect changes in the outcome variable of interest. We will look at an example where a researcher investigates the influence of prednisolone dose (the independent variable) on plasma glucose levels (the dependent variable of interest).

Simple Linear regression analysis

In linear regression analysis, we assume that the relationship between variables can be described by a straight line called the regression line. A simple linear regression analysis only looks at two variables (i.e., one independent and one dependent variable) and is sometimes called bivariate.

Linear regression is typically used with continuous variables, such as height, weight, and blood glucose level, but discrete and even some ordinal variables can be used, and variables can be transformed, for example, by taking logarithms. Traditionally, linear regression was thought of graphically, with the dependent variable plotted on the vertical (y) axis and the independent variable on the horizontal (x) axis. A positive slope shows that as x increases, y increases, whilst in a negative slope, y decreases as x increases (Figure 2). Computer software is used to fit a straight line to the data set.

Regression statistics

The strength and the direction of the relationship between the dependent and independent variables are given by the *correlation coefficient* (r), sometimes referred to as Pearson's correlation coefficient, provided both the dependent and independent variables are normally distributed. If either of the variables is not normally distributed, then Spearman's rho is the non-parametric equivalent of Pearson's r. A perfect direct relationship between the variables is denoted by an r value of +1. An r value of 0 denotes no relationship, while r = -1 indicates a perfect negative relationship (Figure 2). The correlation coefficient values near 1 indicate the strength of the relationship, while the '+' or '–' sign indicates the direction of the relationship. An increase in a dependent variable with an increase in the independent variable indicates a positive correlation, denoted by the '+' sign, while a decrease in a dependent variable with an increase in the independent variable is denoted by a '–' sign. The *p-value* determines

the statistical significance of the correlation coefficient. Significant positive or negative correlation further needs to be assessed statistically by linear regression analysis after assuming certain prerequisites.

Another important statistic is the *regression coefficient* (β) which describes the change in the dependent variable (y) for each one-unit change in the independent variable (x). This corresponds to the gradient of the line using the equation for a straight line: $y = \beta x + c$ where c is the value of y when x is 0 i.e. the intercept (sometimes shown as β0).

Let us consider a hypothetical research project investigating the influence of prednisolone dose on plasma glucose (Figure 3). The linear regression analysis has shown a best-fit line with the equation $y = 1.01 + 0.60x$. The β value (slope, regression coefficient) of 0.60 indicates that for every one-unit increase in the independent variable (dose of prednisolone), the plasma glucose will rise by 0.60 units.

The *R2 value* (sometimes called the coefficient of determination) assesses the strength of the model. In the example, an R2 of 0.82 or 82% indicates that 82% of the variability observed in the dependent variable (y) (plasma glucose) is explained by the regression model, i.e., changes in prednisolone dose (x).

In Figure 3, the *Confidence Interval* (CI), which is typically set at 95%, means that we can be 95% confident that the regression line lies within this range (grey area).

It is important to note that a strong correlation (high r and R2 values that are statistically significant) does not prove cause and effect. For example, another variable that has not been measured (the hidden variable) may be the cause. Linear regression assumes a linear relationship when perhaps the data points would be best fitted on a curved line.

Multiple linear regression analysis is commonly used to examine multiple variables in relation to a single dependent variable. More complicated models use multiple dependent and independent variables (multivariate linear regression). These models provide a more realistic picture than simple linear regressions but still assume a linear relationship.

Logistic regression analysis

Clinical studies that evaluate the association between one or more factors and a single binary outcome, such as the presence or absence of death or disease, most often employ the method of logistic regression. Unlike linear

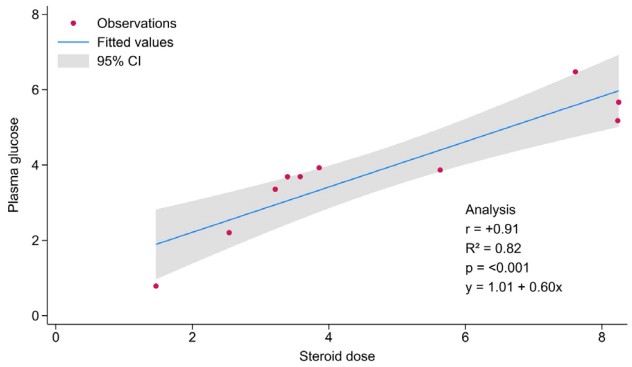

Figure 3: Hypothetical example of linear regression with statistics (explained in the text).

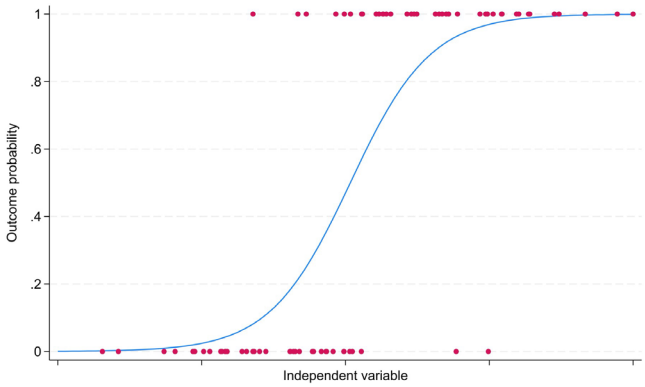

Figure 4: Sigmoid probability curve and example data points

regression, the relationship between the dependent and independent variables does not need to be linear. Whereas linear regression uses the best-fit straight line, logistic regression uses the S-shaped sigmoid curve, known as the logistic function (Figure 4).

Logistic regression calculates the probability of a binary (yes/no) event (the dependent variable) occurring based on one or more independent variables. For example, a researcher wants to know the likelihood of developing diabetes amongst South Sudanese children of different ages, ethnicities, weights, heights, social backgrounds, etc. These independent variables can also be termed risk factors.

The calculations used in logistic regression are complex and are nowadays performed by statistical software. The statistical outcome of logistic regression is usually expressed as the odds ratio (OR) for a unit increase in an

independent variable and the 95% confidence intervals for the OR. We discuss this next.

Odds Ratio

$$\text{The odds ratio (OR)} = \frac{\text{odds of the outcome or event occurring}}{\text{odds of the outcome or event not occurring}}$$

The *odds* are the ratio of two probabilities: the probability that an event will occur divided by the probability that it will not occur.

For exposure to a risk factor, OR can be easily understood as the odds of an event after exposure divided by the odds of the event in the reference group who have not been exposed to the risk factor.

It is easier to think about OR in a contingency table. Consider a hypothetical research project investigating the risk of developing diabetes and exposure to cassava in diet (Table 3).

So the odds of developing diabetes after cassava consumption are (35÷45)÷(10÷45), that is 3.5, and the odds of developing diabetes with no exposure to cassava are (15÷55)÷(40÷55), that is 0.375. An OR of 1.0 suggests that exposure to the independent factor does not affect the probability of disease. OR<1 suggests that the independent variable is a protective factor, making the probability of developing the disease less likely. OR>1 suggests that the variable is a risk factor. In this example, the odds of developing diabetes after exposure to cassava in the diet is 9.33 times greater than the odds for those not consuming cassava.

Note that the OR is quite different from the relative risk or risk ratio (RR), except when the outcome or event is extremely rare. Using the same example, the risk after cassava consumption is 35÷45, and the risk after no consumption is 15÷55, so the relative risk or risk ratio is (35÷45)÷(15÷55), i.e., ≈2.85. Like ORs, RRs should be presented with confidence limits.

Summary

Statistical tests are powerful tools used for all types of clinical research. Selecting the appropriate test is crucial and depends on the study design. Computer programmes are widely available to do the calculations. Of the commonly used tests, the unpaired (standard) t-test is appropriate for comparing means from exactly two groups, such as controls versus experimental group, while the paired t-test is chosen for detecting differences in *before* and *after* type of studies in the same individuals/groups. T-tests should not be used repeatedly in the same study to compare different groups. Where there are more than two groups, the appropriate test is ANOVA: one-way ANOVA if one independent variable, and two-way if two different independent variables, e.g., two different treatments in the same study. Regression analysis allows the researcher to estimate the relationship between dependent variables and one or more explanatory variables. Correctly interpreting observed data provides useful insights for better clinical practice.

Table 3. Relationship between cassava consumption and diabetes (invented data)

		Diabetes		
		Yes	No	**Total**
Cassava in diet	Yes	35	10	**45**
	No	15	40	**55**
	Total	**50**	**50**	**100**

Sources of funding: none

Conflict of interest: none

Further reading

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Simple sample size calculations for cross-sectional studies

James Beard

Independent Consultant

Correspondence:
james@beard.net

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Introduction

In any research study, it is necessary to decide how much data to collect: too little and the study may not produce a useful result; too much and resources will be wasted. In either case, data collection may be considered unethical. This applies both to the amount of information collected about each participant and the number of participants in the study. The current article is about the latter.

Studies with different outcome measures require different approaches to calculating sample size. Below, we look at some simple scenarios, mainly relevant to cross-sectional studies. Formulae are given, and calculations can often be done by hand (or calculator). However, online calculators exist, and some statistical analysis programs include the ability to calculate sample sizes for different problems. Do not be surprised if sample sizes given by the formulae below differ slightly from those given by online calculators or by analysis software. Such calculators may use more complicated formulae that take into account other factors, such as the size of the population being studied, or may be based on different methods of analysis.

Before looking at specific formulae, we need to consider the so-called normal distribution or bell curve (red line in Figure 1). Many statistical tests and formulae

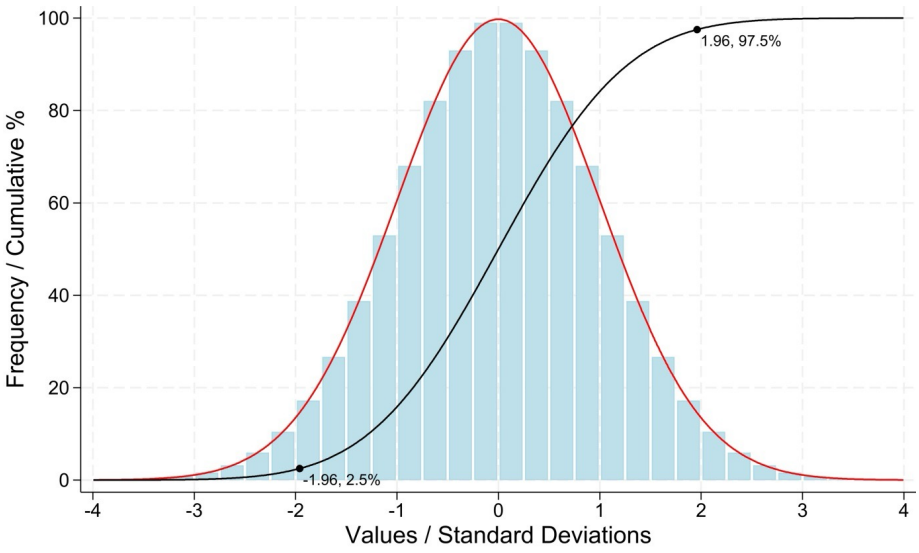

Figure 1. Red line: normal distribution based on 400 observations of a hypothetical variable with mean 0 and standard deviation 1. Black line: cumulative percentage of observations. Blue bars: numbers of observations in 0.25 ranges

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are based on the assumption that the observed values of a variable of interest follow a normal distribution, at least approximately. In Figure 1, the standard deviation (a measure of dispersion of the data) is one, so the X-axis shows both the data values and the number of standard deviations from zero, the mean value. The black line in Figure 1 shows the percentage of observations with a value less than or equal to the value on the X-axis. Note the two highlighted points on that line. These tell us that only 5% (2.5 + (100-97.5)) of observations are more than 1.96 standard deviations below or above the mean value. So, we can have 95% confidence that the true value of our variable lies somewhere in the range mean ±1.96 standard deviations.

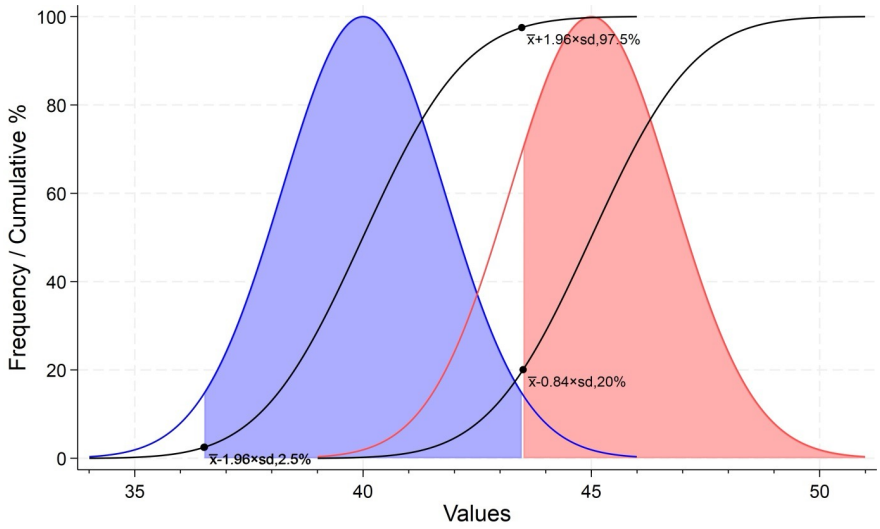

Figure 2. Blue and red lines: normal distributions centred around 40 and 45 respectively. Black line: cumulative percentages of observations for the two distributions. Blue shaded area: 95% of area under blue line. Red shaded area: 80% of area under red line.

$\bar{x}$ = mean, sd = standard deviation

The number of standard deviations from the mean is often referred to as *Z*, which is the meaning of *Z* in the formulae below. One type of *Z* comes from the required confidence interval in our sample size calculations. We have seen above that mean ±1.96 standard deviations gives us 95% confidence, so *Z* is 1.96 for 95% confidence.

Another *Z* is related to the *power* of a study to detect a difference between two groups, which is often set to 80%. For example, we might conduct a study in which we think two groups may have mean values of 40 and 45 for a particular variable. We must ensure that we collect enough data to be able to claim that a detected difference is likely to be real. Figure 2 shows distributions centred around 40 and 45, our supposed mean values for the two groups. In Figure 2, if the red- and blue-shaded areas do not overlap, we get 95% confidence and 80% power to show a difference (the larger the sample, the narrower the distributions will be).

Some useful values of *Z* are shown in Table 1.

Note that the formulae assume that the sample to be taken will be representative of the population studied. There may be practical reasons why this is difficult to achieve; for example, it may be easier to recruit women than men. This has to be allowed for in the study design and, hence, sample size calculations.

The formulae require an estimate of the quantity the study is attempting to measure (a value or a difference). This can often be found in the literature, but it may be necessary to carry out a small pilot study to get an appropriate value. In simple prevalence studies, it is safe to assume 50% prevalence, as this will result in the largest sample size.

Table 1. Values of *Z* for some power and confidence percentages. Commonly used values in bold

Power %	Conf. %	*Z*
80.0	60.0	0.84
90.0	80.0	1.28
95.0	**90.0**	1.64
97.5	**95.0**	1.96
99.0	98.0	2.33
99.5	**99.0**	2.58

Some Formulae

1. The prevalence of an attribute in a population

For example, the prevalence of type 2 diabetes in 18- to 59-year-olds in urban Juba. Cochran's formula is almost always used for such studies:

$$\frac{Z^2 * p * (1-p)}{e^2}$$

The formula's inputs are Z (the first Z mentioned above) for the desired confidence level, p an estimate of the outcome prevalence, and e, the desired absolute precision of the result. Common values used in this calculation are 1.96 (for 95%), 0.5 (50%), and 0.05 (±5%), respectively, which gives a sample size of 385. If ±3% precision was wanted instead, the required sample size would be much bigger, 1068.

2. The difference in prevalence between two groups

If the researchers were not only interested in the overall prevalence discussed in the previous section but also in differences between (say) men and women, a different calculation is needed:

$$\frac{(Z_a + Z_b)^2 * (p_1 * (1 - p_1) + p_2 * (1 - p_2))}{(p_1 - p_2)^2}$$

Here, we have both Zs mentioned above. Z_a is the Z related to the desired confidence level, while Z_b is related to the required power of the study to detect a difference between the two groups. p_1 and p_2 are the estimated proportions for each group. As before, the confidence level is often 95%, so Z_a is 1.96, and the power is commonly 80%, so Z_b is 0.84. Although again, the nearer the estimated proportions are to 50%, the larger the required sample size, the hypothesised difference has more effect on the required sample size. A safe option is to choose two values, around 50%, that are different by the expected difference between the groups. Say the hypothesised difference was 10%, then 0.45 and 0.55 would be appropriate values for p_1 and p_2. These inputs give a sample size of 389 *per group*. Reducing the difference to 5% would give a much larger sample size, 1565 per group.

3. The mean of an attribute in a population

For example, the systolic blood pressure of men aged 60 to 69 in rural South Sudan. The required sample size can be calculated using the formula

$$\frac{Z^2 * \sigma^2}{e^2}$$

where Z is related to the required confidence interval, σ is the estimated standard deviation of the attribute in the population, and e is the desired absolute precision of the result. It does not matter what units are used for σ and e, but the same units must be used for both. The estimate for σ would typically come from other studies conducted in similar populations. If we again want 95% confidence in our result, Z would be 1.96. If we say σ is 20mmHg and we want a result accurate to ±2mmHg, then 385 would be the required sample size.

4. The difference between two means

For example, the difference between mean systolic blood pressure for men and women in the same population. In this case, the formula is

$$\frac{(Z_a + Z_b)^2 * 2 * \sigma^2}{d^2}$$

where Z_a and Z_b are related to the confidence interval and power required respectively, σ is the estimated standard deviation as in Formula 3 above, and d is the hypothesised absolute difference that the researchers wish to detect. Again, σ and d must be measured in the same units. For 95% confidence, Z_a will be 1.96; for 80% power, Z_b will be 0.84. Assuming that the standard deviation σ is again 20mmHg and we wish to detect a difference between the groups of 10mmHg, we would need a sample of 63 *per group*.

Summary

The scenarios above are just a few of the many that could be relevant to a real research study, and they are among the simplest. More complicated scenarios include:

- Comparing more than two groups
- Multiple outcome measures
- Different sample sizes in different study groups
- Different standard deviations in different study groups
- Clustered data (by village or hospital, for example)
- Paired data

In such cases, a competent statistician is needed to advise on the analysis to be done and to calculate an appropriate sample size (this should all be done before any data are collected).

Having calculated the statistically necessary sample size, researchers must consider whether this sample would be enough in practice. For example, the assumptions on which the sample size calculation was based may have been optimistic. Some potential participants may refuse consent, and others may be lost to follow-up (depending on the design of the study). Thus, the target sample size may need to be greater than the calculated minimum.

Smith, Morrow, and Ross provide a more detailed discussion of this topic.[1]

Internet Resources

There are many websites with a selection of easy-to-use sample size calculators, including:

- https://select-statistics.co.uk/calculators
- https://epitools.ausvet.com.au/samplesize
- http://www.openepi.com/Menu/OE_Menu.htm (Sample Size in the left-hand pane)

Note that some calculators ask for the estimated population variance of the outcome variable rather than the standard deviation - this is just the standard deviation squared, σ^2.

Acknowledgement: The author would like to thank Dr Indranil Saha of the Indian Council of Medical Research for his helpful comments on a draft of this article.

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South Sudan medics trial AI app to identify snakes and improve bite treatment

Software with a database of 380,000 pictures aims to aid quick and accurate identification and ensure correct use of antivenoms

The race to treat snakebite patients in time to save them could be eased by the development of software powered by artificial intelligence.

The medical charity Médecins Sans Frontières (MSF) is trialling AI snake detection in South Sudan using a database of 380,000 pictures of snakes to identify venomous species.

According to the World Health Organization (WHO), as many as 5.4 million people are bitten by snakes each year, of whom up to 2.7 million become seriously ill and 138,000 die from complications. Identification is a difficult but crucial part of treatment to ensure that rare and expensive antivenoms are only used when necessary.

Dr Gabriel Alcoba, an MSF medical adviser on snakebites and neglected tropical diseases, said: “Early results are promising; the AI sometimes identifies snakes even better than experts.”

https://www.theguardian.com/global-development/2024/sep/25/south-sudan-medics-trial-ai-software-to-identify-snake-and-improve-bite-treatment

How to author a research proposal for a dissertation or thesis: A guide for South Sudanese medical postgraduates

John Adwok

Consultant General and Endocrine Surgeon, Nairobi Hospital, Kenya

Correspondence:
John Adwok
jadwok52@gmail.com

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ABSTRACT

A research proposal is a three-chapter document that outlines a study to be conducted for a dissertation or thesis. The three chapters of a proposal include the Introduction, a literature review on the chosen topic, and the research methodology proposed for the study. After successfully navigating the proposal process and receiving approval from the academic research team and the Research Ethics Committee, one can proceed with the actual research project. In South Sudan, all healthcare-related research proposals must be approved by the South Sudan Research Ethics Committee (SSREC) based at the Ministry of Health, as institutional committees still need to be established. Authoring a research proposal as a postgraduate medical professional in a resource-poor country like South Sudan poses challenges related to inadequate healthcare infrastructure and research facilities and limited access to the internet and medical libraries. Therefore, it is important to consider the scope of the proposed research carefully and select a clear topic that addresses a significant medical topic relevant to the population's healthcare. This overview aims to guide medical postgraduate students in South Sudan and other resource-limited regions on their dissertation and thesis projects.

Introduction

It is crucial to remember that a dissertation or thesis proposal is a scholarly document. The writing must adhere to prescribed rules, formats, and conventions known as scholarly writing, distinct from those of creative or technical writing.[1] Your supervisor will be looking for specific attributes of scholarly writing, including precision and accuracy, clarity, and objectivity supported by in-text citations.[2] It is important to avoid colloquial expressions, pronouns, and contractions, minimize abbreviations and acronyms, and consistently use the active voice rather than the passive voice. Several citation styles exist, including Harvard, APA, Vancouver, and MLA, and your institution will indicate which one to use. The Vancouver formatting style is the one used by most biomedical journals. The proposed research should contribute meaningfully to medicine in general and the research community and be supported by enough accessible publications for reference.[2] Additionally, you must ensure you can conduct the study within the anticipated time limit with available resources.

Citation: Adwok, How to author a research proposal for a dissertation or thesis: A guide for South Sudanese medical postgraduates, South Sudan Medical Journal, 2024;17(4):217-220 © 2024 The Author(s) **License:** This is an open access article under CC BY-NC DOI: https://dx.doi.org/10.4314/ssmj.v17i4.13

If you are a medical professional planning to conduct research in South Sudan as part of a higher academic degree, below is an overview of the three chapters and the key information to include in each to produce a compelling proposal. Your research and the eventual writing of your dissertation or thesis will only take place after the research committee has approved your proposal. A well-developed proposal is critical in convincing the research committee of the value of your proposed research and may also enhance your chances of securing funding. With minimal adjustments, these three chapters will form the basis of your dissertation or thesis. Always add sources to your work by following the citation guidelines of the institutional or journal formatting style to avoid plagiarism.

Note that during this stage, refer to your work as the "proposed research study" rather than "this study." Below is a structured guide to help you effectively draft your dissertation proposal, starting with the title page, introduction, literature review, and finally, the research methods.

Title Page

Begin with the title page formatted strictly to the chosen style guidelines. For example, in The Vancouver formatting style, the proposed dissertation or thesis title is centered; skip a few lines, then enter your name and credentials. Then indicate the institution or organisation name and department name followed by the contact information, including address, email, telephone number, and date. Finalise by indicating the word count. The title should be concise and capture the essence of the proposed research without being wordy. The formatting style (e.g., APA, MLA, Vancouver, Harvard.) for the title page and, indeed, the whole proposal and eventual dissertation or thesis will follow the style used in your institution or provided by your institutional research committee. Your title page is followed by a summary of the proposal, usually not exceeding 250 words, followed by a list of keywords that summarise the content of your proposal.

Chapter 1. Introduction

The introduction sets out the problem concisely to ensure that it is clearly understood. It is essential to demonstrate that the research topic is worth further investigation globally and locally.[2] Therefore, this section aims to provide a brief overview of the available literature on the proposed research topic, highlighting its relevance and importance within the broader medical field. At this stage, it is crucial to convince the reader that this topic warrants serious scientific scrutiny. You can narrow down to specific health challenges in South Sudan, discussing how the medical issue you propose to study disproportionately affects the local population due to resource constraints, limited healthcare infrastructure, and social determinants such as poverty, education, and access to healthcare services.[3] Include relevant data highlighting the prevalence or burden of the specific health issue in South Sudan, as these will emphasise the need for the proposed study.

Provide a brief description of the problem, including its clinical relevance, and discuss the specific challenges faced by South Sudan in addressing the health issue. This might include a lack of health professionals, inadequate diagnostic tools, poor healthcare infrastructure, or socio-economic barriers.[4] Illustrate the impact of the medical issue on the health, quality of life, and economic stability of South Sudanese. The purpose of a medical dissertation or thesis is to generate new, significant knowledge that will enhance understanding of a medical condition or problem. Do not miss the opportunity in this section to identify problems that emerge from the literature, as many scholarly papers and journal articles conclude with recommendations for further studies.[5] Your purpose statement clearly states which gaps in the literature your proposed research will attempt to fill and the research methods you will use. Typically, the last sentence in this section is a single, clearly focused problem statement that indicates the specific issue or medical condition to be researched. At this point, you can state the primary research question that will guide the proposed dissertation based on the narrowed-down problem statement. One or several research questions can be formulated for a quantitative research study.

Chapter 2. Literature review

The literature review is designed to summarize the existing medical research relevant to your proposed study, pinpointing gaps in current knowledge and justifying the necessity for your research. Start by clarifying the purpose of the literature review, emphasizing that this chapter will deliver a thorough overview of pertinent current research and identify the gaps that your research aims to fill.[5] Outline your research strategy by specifying the medical database utilised for the literature review, such as PubMed, Medline, Cochrane Library, Google scholar, and other peer-reviewed sources. Include details on the search terms and keywords employed to locate relevant studies. Additionally, clarify any criteria used for including or

excluding any studies, such as time frame, study design, or language. This approach will enable the reader to understand and evaluate your methodology in conducting a thorough and scientifically sound review. Summarise key studies, detailing their methodologies, findings, and relevance to your proposed topic. It is important to note that the literature review chapter of the proposal should always be written in the past tense, whereas chapters one and three of the proposal can be expressed in the present or future tense.

Critically assess the strengths and weaknesses of each study you identify in the literature review, focusing on aspects such as sample size, study design, or potential biases that might impact the reliability of the findings. Illustrate how different studies converge or diverge in their conclusions and highlight any conflicting results, along with possible explanations for these variances.[6] It is essential to identify and discuss gaps in the existing literature, which may stem from methodical limitations, incomplete research, or areas yielding inconclusive findings. Discussing the significance of these gaps and how your proposed research aims to address them will illustrate your comprehension of the academic conversation surrounding your topic. Identifying these gaps will lay a foundation for your research questions and objectives.

Furthermore, it is vital to articulate clear and specific research objectives based on the identified gaps in the literature review. Justify your proposed study by explaining how it builds upon existing work and clarify the need for your research by demonstrating its potential to contribute new insights, methodologies, or clinical applications.[7] Also, identify unresolved questions in the literature that your study will address and advance the field of study. Conclude your literature review with a clear statement on how your proposed research will fill existing gaps and advance the field of study. Use a consistent citation style for your references, such as the Vancouver or APA, depending on your institution's guidelines.

Chapter 3. Research Methodology

This chapter is crucial for your proposal. Even in a developing country like South Sudan, it is important to focus on the standard research components while acknowledging the unique challenges posed by resource constraints, poor healthcare infrastructure, and cultural context.[3] Start by briefly summarizing the research question or hypothesis and explain why it is important to study this in the South Sudan context. Outline the research design, including population sampling methods, data collection, and analysis techniques that you will use.[8] Clearly indicate whether your study is observational (cross-sectional, cohort, or case-control) or experimental (e.g., randomized controlled trial), and explain why your chosen design is appropriate for your proposed research question. Specify the instruments you will use, such as surveys, interviews, or other methods, along with any analytical techniques. This section is vital as it establishes the feasibility of your proposed study and provides a road map for how the research will be conducted.

Provide a detailed description of the healthcare or community environment where your proposed research will be conducted, be it rural, urban, a clinic, or a community health centre. Justify your choice of setting by explaining its relevance in addressing the research question, particularly considering the healthcare challenges faced in South Sudan.[3,4,12] Identify the target population for your study by defining its characteristics, such as age, sex, and specific health conditions. Additionally, outline the inclusion and exclusion criteria for your research, along with a clear rationale for these criteria. In a population survey study, a formal method is employed to calculate the necessary sample size, considering potential participant dropouts and the statistical power required for obtaining reliable results while also considering the limited healthcare data available in South Sudan.[8] Discuss the chosen sampling method (e.g., random, convenience, or stratified sampling) and justify its suitability in the local context.

Carefully consider your data collection methods by detailing the techniques you will use, such as interviews, surveys, medical tests, or focus groups. Specify the tools you intend to use, such as questionnaires or diagnostic tests, and indicate whether these tools have been validated within the unique cultural and resource-constrained environment of South Sudan. If relevant to your proposed research, describe any existing health records, national surveys, or databases you plan to use, explaining their reliability and accessibility in South Sudan. Additionally, clarify who will be responsible for data collection, whether it will be trained healthcare workers, medical students, etc. Describe any training that will take place to ensure the accuracy of the data collected. Considering the local cultural and resource contexts, describe how you will address ethical concerns, including informed consent, confidentiality, and any potential risks to participants. Finally, explain the process for obtaining the necessary ethics approval from the appropriate authorities.

At this stage, identify the main independent variables (exposures, treatments) you are interested in studying. Then, define the dependent or outcome variables you will measure (disease, prevalence, patient outcomes). Also, mention any expected confounding factors (socio-economic status, access to healthcare) and explain how you will control for them in the analysis. Then, describe the statistical analysis methods you will use to analyze the data (t-tests, Chi-squared tests, regression analysis), justifying their suitability for the type of data and research design.[10] Mention the software tools you plan to use for analysis (SPSS, STATA, etc.), ensuring they are accessible and feasible in your research setting. Next, you explain how you will deal with missing or incomplete data, a significant issue in resource-poor countries like South Sudan. Identify any limitations to your proposed research, such as small sample sizes, challenges in accessing health records, or variability in data quality, and discuss how you will mitigate them.

Next, estimate the resources required for the study (e.g., equipment, personnel, travel), considering any challenges and constraints you will face when researching South Sudan. Mention any potential funding sources or partnerships that could support the study.[3,4,10] Offer a realistic timeline for the proposed research, bearing in mind delays due to logistical challenges like transport, difficulties recruiting participants, and slower ethical approval processes. Next, address the ethical and cultural considerations. Cultural sensitivity is essential when doing population-based research. Discuss how local cultural norms such as gender dynamics, beliefs about illness, and healthcare-seeking behaviours will be respected. Outline any plans to involve community leaders or stakeholders to ensure that the local population receives and understands the research well. Mitigate potential challenges such as limited healthcare infrastructure, participant dropout, and unreliable data by proposing contingency plans. In the case of clinical trials, outline the safety monitoring procedures and protocols you will use to ensure participant wellbeing.

Conclude this chapter by summarising the strengths of your proposed research methodology and how it is well suited to answer your research question(s) within the context of a developing country like South Sudan. Several books and articles on dissertation and thesis writing are available online to help you plan and write your proposal and your complete dissertation or thesis.[9,13,14] By framing your proposed methodology as above, you adhere to rigorous academic standards and show that you have considered the specific logistical, cultural, and ethical challenges of conducting research in a resource-poor country.

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Soft skills: The underappreciated determinants of success in health research

Kayondo Jane Frances Kengeya

Rounding up the Edges (ROUTE) International

Correspondence:
Kayondo Jane Frances Kengeya
kengeyakayondo@gmail.com

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Introduction and definition

Technical expertise is often regarded as the primary driver of success in health research. While undoubtedly crucial, a growing body of evidence shows that an essential set of soft skills is just as important as technical expertise for success in educational attainment, employment, research, and earnings.[1] Success in health research involves more than excelling in statistical analysis and research procedures. Soft skills complement and enhance technical expertise.

Soft skills are personal and interpersonal attributes, behaviours, and attitudes that influence how effectively individuals interact with others and navigate research environments.[2] They include communication, teamwork, empathy, adaptability, confidence, time management, critical thinking, social aptitude, organizational skills, leadership abilities, ethical attitudes, problem-solving, self-evaluation, and delegation.

While technical skills may secure you a position in health research, soft skills are the keys to your professional and career advancement and success.[3] Soft skills are needed by every type and cadre of health research operative: doctors, medical assistants, nurses, pharmacists, technologists, technicians, psychiatrists, counsellors, health educators, managerial and support personnel, medical and nursing students, community health professionals, and field workers.[4]

Examples of the role of soft skills in health research

In order to succeed in health research, one must be able to assemble an interdisciplinary research team that works well together in an environment of respect and good conflict resolution.[5] Successful research teams are formed and strengthened by soft skills, including effective communication, teamwork, adaptability, problem-solving, leadership, emotional intelligence, time management, and conflict resolution.

To clearly express research ideas and win over potential partners, effective communication is essential.[6] It facilitates communicating research to coworkers, collaborators, sponsors, and the general public while also converting complex concepts into comprehensible spoken or written language.

While not all researchers will assume formal leadership roles, leadership skills are required to identify research gaps and formulate compelling research questions. Everyone in a research team needs to be able to inspire, motivate, and influence colleagues.

Research is, by its very nature, a problem-solving endeavour. To overcome obstacles and accomplish research objectives, one must possess critical thinking

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and creative problem-solving skills.[7]

To master new techniques and technologies and get beyond unforeseen obstacles, researchers and teams need to be adaptable and flexible.[8] Building solid connections, settling disputes, and upholding a supportive research environment all depend on emotional intelligence, which is the capacity to recognize, comprehend, and control one's emotions and that of others.[9]

As it requires building rapport with study participants, conducting transparent interviews or surveys, and coordinating data-gathering activities among team members, data collection largely depends on communication and cooperation.[10]

Adaptability and a high level of emotional intelligence are necessary for treating delicate subjects with empathy, keeping participant anonymity, and modifying data collection techniques in response to unforeseen difficulties.

Soft skills are also required for data interpretation and analysis. Strong communication skills are necessary to convey complex statistical findings to audiences that are both technical and non-technical.[11] Working as a team to interpret data with statisticians and other specialists is necessary. Critical thinking and problem-solving abilities are required to spot patterns and trends in data and generate well-founded judgments.

Soft skills have a big impact on how research findings are shared. Effective communication is necessary when creating readable and captivating research articles and presentations. Working in tandem with other authors and journal editors requires teamwork skills.

Leadership abilities are frequently required when presenting research findings at conferences and to the general public.[12] Flexibility is also required when reacting to criticism and revising study protocols and manuscripts.

How soft skills are acquired

Soft skills are not innate talents but are developed through deliberate learning, training, practice, experience, and conscious effort. While some individuals may exhibit natural inclinations towards certain soft skills, everyone has the capacity to cultivate and refine them. Recognizing that soft skills are learnable abilities empowers individuals and organizations to invest in their development.[13] A comprehensive approach is necessary, including soft skill integration into educational curricula, individual and group training, coaching and mentoring, and creating a culture of support within organizations.[14] To assess the effectiveness of soft skill, implementation research and case studies for outcome measurement are essential.[15] Health research organizations and institutions may change the health research landscape by prioritizing soft skills, which will enhance public health, patient care, teamwork, and overall research efficiency.

Enhancing soft skills at the individual level may involve asking mentors and colleagues for feedback on your communication and interpersonal style regularly, actively listening to others, becoming more self-aware by realizing how emotions affect interactions, growing your professional network through participation in online forums, conferences, and workshops, working with people from different backgrounds to widen your perspective, and practicing public speaking to get over any fear and effectively communicate your research findings.[16]

Research institutions and researchers can significantly improve their research success and contribution to knowledge advancement by investing time, energy, and resources in developing soft skills.

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Africa:

Why Women's Health Matters For Everyone's Future

Maternal health, which refers to the health of women during pregnancy, childbirth, and the postpartum period, according to WHO Africa, faces a troubling trend worldwide.

An estimated 287,000 women globally lost their lives due to maternal causes, according to a report by the World Health Organization (WHO). The majority of these deaths, a staggering 70%, occur in sub-Saharan Africa. The major causes of these preventable deaths include pre-existing medical conditions that worsen during pregnancy, high blood pressure, unsafe abortions, excessive bleeding, obstructed labor, and infections.

A troubling trend in maternal health worldwide, according to WHO, is the death of a woman in childbirth or pregnancy roughly every two minutes. The UN agency warns that without significant progress towards Sustainable Development Goals (SDGs) global goals for reducing maternal mortality rates, over a million more women could tragically lose their lives by 2030.

https://allafrica.com/stories/202406040353.html?utm_campaign=daily-headlines&utm_medium=email&utm_source=newsletter&utm_content=aans-view-link

Delayed stroke diagnosis with fatal outcome in South Sudan: need for greater awareness

Kenyi Alex Daniel and Ronald Woro

Authors Affiliations:
Juba Medical Complex, Juba, South Sudan

Correspondence:
Kenyi Alex
kenyialex434@gmail.com

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ABSTRACT

Spontaneous intracerebral haemorrhage is a stroke subtype that is associated with high morbidity and mortality due to mass effect raised intracranial pressure, and injury to the surrounding brain tissue. We report a case of a 35-year-old female with a massive left parietal intracerebral haemorrhage of sudden onset followed by rapid neurological deterioration due to the mass effect. An urgent brain Computed Axial Tomographic (CT) scan, and basic laboratory tests were obtained. Supportive treatment with intravenous fluids and management of physiological parameters were planned but could not be instituted due to the rapid deterioration of the patient's condition. A risk factor could have been previously undetected such as uncontrolled hypertension though vascular abnormalities e.g. burst aneurysm or arterio-venous malformation were possible. She died within an hour of presentation to the hospital. We conclude that prompt diagnosis and management of intracerebral haemorrhage is a significant challenge in South Sudan due to limited awareness, facilities, and late presentation of stroke.

Introduction

Spontaneous intracerebral haemorrhage is a stroke subtype that is associated with high morbidity and mortality due to the mass effect of raised intracranial pressure and injury on the surrounding brain tissue. It accounts for half of the disability-adjusted life years lost, though it only represents 10-15% of strokes. Spontaneous intracerebral haemorrhage in young patients is not a common hospital presentation among stroke cases in South Sudan.

We report a case of a 35-year-old female with a massive left parietal intracerebral haemorrhage of sudden onset followed by rapid neurological deterioration due to the mass effect.

Case presentation

A 35-year-old female, mother of six children, presented to Juba Medical Complex (JMC) accompanied by relatives. She was previously well. Three days before the presentation, she developed severe intermittent headaches without visual disturbances or fever. She was assessed at another nearby facility the same morning that she was brought to the hospital. She had been diagnosed with malaria and typhoid fever and started on intravenous artesunate for malaria

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and ceftriaxone for suspected typhoid fever. On arrival at JMC, a right-sided weakness was noted, and sudden loss of consciousness was associated with deviation of the mouth to the right side. She was afebrile. A single seizure with urinary incontinence occurred just before she died. Her past medical and surgical history was unremarkable.

On examination at JMC, she had laboured breathing and a reduced level of consciousness with a Glasgow coma scale of 6 out of 15. She was overweight, but her body mass index was not available. Blood pressure was 122/77 mmHg in the left arm using a mercury sphygmomanometer, pulse rate 98 beats per minute, regular and of normal volume. The respiratory rate was 27 breaths per minute with oxygen saturation of 70% on room air and axillary temperature of 36.3 °C.

Power was graded as 0/6 on the right side and 4/6 on the left side on the Medical Research Council scale. Reflexes were equivocal on both sides. The tone was flaccid. Pupils reacted sluggishly to direct light. Assessment of other body systems was unremarkable.

The limited laboratory blood tests before she died showed total white blood cells 14.2 x10^9 (3.5 – 11.5) with neutrophilia, haemoglobin 11.0g/dl (13.5-15.5), and platelets 287x10^9 (150-450). Blood film for malaria showed moderate *Plasmodium falciparum* parasites; random blood sugar was 6.5mmol/L (reference range 4.2-8.6mmol/L). Our differential diagnosis was a stroke and cerebral venous thrombosis. An urgent brain CT scan was obtained (Figure 1) and demonstrated a large left parietal haemorrhage leading to sudden deterioration and death.

Discussion

Because of the patient's rapid deterioration and death, there was no opportunity to carry out other laboratory investigations, such as serum electrolytes, creatinine, coagulation profile, cardiac enzymes, toxicology screening, and arterial blood gases, in order to exclude other causes with similar symptoms. The initial presenting symptoms were nonspecific. Malaria and enteric fever are prevalent locally, hence the initial management. Our management was supportive of the urgent transfer to the intensive care unit (ICU) at Juba Teaching Hospital. Close relatives were informed about the patient's condition and CT scan findings, indicating poor outcomes. A risk factor could have been previously undetected such as uncontrolled hypertension though vascular abnormalities e.g. burst aneurysm or arterio-venous malformation were possible.

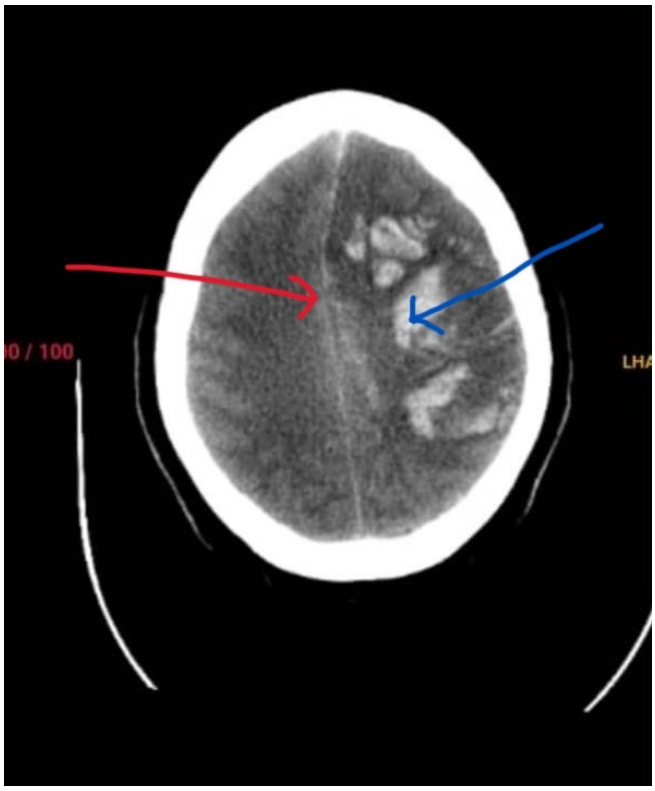

Figure 1. CT brain scan indicating the intracerebral haemorrhage (blue arrow) and the midline shift (red arrow)

Her level of consciousness decreased quickly, with subsequent death consequent upon the intracerebral bleeding and expansion of the haematoma as indicated by the significant midline shift on the CT scan (Figure 1). Haematoma expansion, as seen on follow-up CT brain scans, which were not shown in this patient, is associated with a poor prognosis.[1] However, patients with moderate to large ICH baseline volumes (about 75ml) at the early presentation from symptom onset have the highest risk for haematoma expansion.[2]

The high peripheral neutrophils are probably reactive neutrophilia and unlikely to influence the prognosis. However, studies on the relevance of inflammatory and oxidative stress markers in ICH as prognostic markers for the quantification of oedema volume were noted to play a crucial role in secondary brain damage and oedema formation.[3,4]

This case highlights the lack of awareness and preventive programmes in South Sudan and many other African countries.[5] There are no studies conducted to determine the burden of strokes in South Sudan. Most of the cases we

diagnose with stroke in our facility are due to ischaemia. A systematic review and meta-analysis on the epidemiology of ICH conducted in 52 studies noted that the incidence of ICH had not decreased in the last 40 years worldwide, with a higher incidence in Asia than in other continents. It is also noted that the incidence increases with age and differs at the 85-year boundary, with men more likely to develop ICH than women, with the basal ganglia being the common area for ICH.[6] Relevant studies have noted a rise in stroke incidence, especially in urban areas compared to rural areas.[7] Most patients diagnosed with stroke present for the first time with weakness, slurred speech, or decreased level of consciousness without a prior history of hypertension. Hypertension (systolic BP>/=140mmHg and diastolic BP>/=90mmHg) is a modifiable risk factor.

Data analyses from 125 population-based studies in 2010, including 968,419 adults from 90 countries, estimated the global prevalence of hypertension and/ or current use of anti-hypertensives was 31.1%. Slightly higher in men than women and was lower (28.5%) in high-income countries than low- or middle-income countries (31.5%). In women, it was lowest in highest income countries (25.3%) and highest in sub-Saharan Africa (36.3%).[8] Hypertension in Africa has been on the rise. A study in Nigeria indicated an increase in the prevalence of hypertension, especially in women, with half of the hypertensive individuals untreated or poorly controlled. [9] Other studies have also noted a similar increase in hypertension and strokes.[9] The burden resulting from stroke has been on the increase in Africa.[10,11]

Diagnostic facilities for stroke are very limited in South Sudan, with only four functional health units having CT scanners and only one facility with MRI. All are located in Juba. At JMC, we diagnose stroke cases with CT scanning, which is readily available, unlike a few years ago when this imaging modality was lacking. Non-contrast CT scanning is rapid, highly sensitive, and specific for identifying ICH.[12] Magnetic resonance imaging (MRI) is more sensitive for ICH.[13] Hyperacute ICH has unique imaging features on stroke MRI and is detectable with excellent accuracy, especially in chronic ICH.[14] However, brain CT scanning of our patient provided the diagnosis. Additional CT angiography (CTA) and contrast-enhanced CT help spot underlying cerebral small vessel disease and identify patients at risk of ICH expansion.[15,16] CTA and perfusion studies are not available in South Sudan.

Management of stroke requires stroke units with trained healthcare personnel, clear agreed guidelines, and emergency services.[17] This is lacking in South Sudan. In contrast to developed countries where there are emergency services with quick access to diagnostic scans and the possibility of thrombolysis for ischaemic stroke,[18] most patients we receive with stroke present after days of developing symptoms due to lack of accessibility to emergency services. Others opt for traditional management before considering hospital management. This is possibly due to a lack of awareness about stroke. In addition, a lack of unified guidelines is a common challenge in most low-and-middle-income countries.[19] The few available health facilities are poorly equipped to handle acute stroke cases. There are no available unified guidelines for stroke management and stroke training programmes for doctors and nurses, which is a common challenge in most low- and middle-income countries.

Rehabilitation is an essential aspect of stroke management. The rehabilitation centres available across South Sudan are inadequate. This would enhance the speed of recovery and, in turn, reduce the disability burden in society.[18] The lack of research facilities makes it difficult to address the root causes of strokes, which would help policymakers in planning.

Conclusion

In South Sudan, the burden of ICH is unclear, but stroke cases have risen in recent years. Limited access to diagnostic tools means many strokes, both ischaemic and haemorrhagic, go undiagnosed. Poor health facilities, a lack of CT scanners, specialized stroke units, and precise management guidelines contribute to inadequate stroke care. To address this, South Sudan needs focused management guidelines, stroke units, diagnostic and research facilities, and public awareness campaigns to improve early detection and treatment. These issues present significant challenges for policymakers, the government, and partners.

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Long-standing retention of a large intraconal wooden foreign body associated with a discharging fistula and inflammation in a Burkinabe patient

Gilbert Batieka Bonsaana[1], Mikdad Abubakari Robilu[2] and Edmund Muonir Der[3]

Authors Affiliations:
1. Department of Ophthalmology, School of Medicine, University for Development Studies, Tamale Teaching Hospital, Tamale, Ghana,
2. Department of Pathology, Tamale Teaching Hospital, Tamale, Ghana,
3. Department of Pathology, School of Medicine, University for Development Studies, Tamale Teaching Hospital, Tamale, Ghana

Correspondence:
Gilbert Batieka Bonsaana
gbonsaana@uds.edu.gh

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ABSTRACT

A high index of suspicion and early intervention could avert loss of vision and other complications associated with organic intraorbital foreign bodies, which are often difficult to diagnose with radiographs. We report the case of a 12-year-old female with a large intraconal wooden foreign body that had remained quiescent for one year following left orbital trauma. She complained of a history of gradual loss of vision, painful proptosis, and discharging orbital fistula for three months prior to presentation. Orbital ultrasonography and CT scan failed to show an intraorbital abscess or foreign body. However, an explorative orbitotomy revealed an intraconal foreign body measuring 5x1x0.2cm with associated granulomatous inflammation. Her psychological symptoms improved following surgery, though her vision remained unchanged.

Introduction

Intraorbital foreign bodies are within the orbit but outside the eyeball.[1,2] Foreign bodies inside the orbital cavity are rare. Depending on their nature and size, they can cause serious complications.[1] Wooden foreign bodies are notorious for remaining quiescent for long periods before presenting with various complications. The entry wound may often be small, self-sealing, and typically extra-marginal. Wooden foreign bodies also show a propensity to break during attempted removal. Detection of intraorbital foreign bodies requires a high index of suspicion and detailed history-taking.[3] Intraorbital wood is often not detected by standard diagnostic radiography such as computed tomography (CT) scan. The presence of an intraorbital mass with a discharging sinus should evoke suspicion of a retained organic foreign body, regardless of the time interval between the trauma and current presentation.[4] Here, the authors described the case of painful proptosis and loss of vision associated with a discharging orbital fistula following trauma to the left orbit.

Case Report

A 12-year-old, an otherwise healthy black female from Ouagadougou, Burkina Faso, presented with a penetrating injury to the inferolateral aspect of the left

orbit. She had a history of falling onto a piece of wood (a stick) the previous year. She was attended to in a hospital in Ouagadougou, with surgical removal of multiple wooden foreign bodies from the left orbit. The patient was doing well until six months following the surgery when she started experiencing severe pain in the affected eye associated with headache, protrusion of the left eye, and discharge from the inferolateral periorbital region (Figure 1). She was re-admitted at the same hospital and managed with intravenous antibiotics and analgesics. The pain and discharge improved, but there was persistent proptosis. She self-referred one year after the original trauma to Tamale Teaching Hospital (TTH) Eye Clinic in Tamale, Ghana, following several failed traditional/herbal treatments over three months.

Figure 1. Patient with the eyes in the primary position. The arrow shows proptosis and discharging fistula of the left orbit

On examination, the patient's general condition was satisfactory. The vision was 6/6 in the right eye, and no perception of light (NPL) in the left eye. The intra-ocular pressure was 14 mmHg and 18 mmHg in the right and left eye, respectively. There was a discharging fistula 3 mm below the lower lid margin of the left eye and 4 mm medial to the lateral canthus from a self-sealed wound, probably the entry wound (Figure 1). There was limited adduction of the left globe (Figure 2A), normal abduction (Figure 2B), and limited inferior- and supraduction of the left globe (Figures 3A and 3B) associated with proptosis of 4 cm measured with a ruler from the orbital rim at the lateral canthus. The orbital rim was palpable with no discontinuity or crepitus. No orbital mass was palpable. There was a relative afferent pupillary defect grade IV (RAPD IV, fixed dilated pupil) in the left eye; the lens and vitreous were clear, and there were no retinal, vascular, or choroidal abnormalities. The cup/disc ratio (CDR) was 0.3, with a normal macular reflex. The anterior and posterior segments of the right eye were normal.

Orbital ultrasonography did not indicate a foreign body or orbital abscess in the left orbit. Both eyeballs had normal ultrasonographic features. A contrast-enhanced CT scan of the head and orbit showed anterior displacement of the left globe, causing proptosis without features of an

Figure 2A. Patient with the eyes in the right gaze. The arrow shows limited adduction of the left eye, i.e. left eye remains central and not crossing the midline.

Figure 2B. Patient with the eyes in the left gaze. The arrow shows full abduction of the left eye.

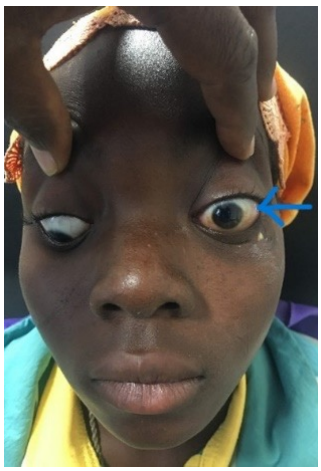

Figure 3A. Patient with the eyes in the down gaze. The arrow shows limited inferior-duction of the left eye, i.e. remains central and not crossing the midline.

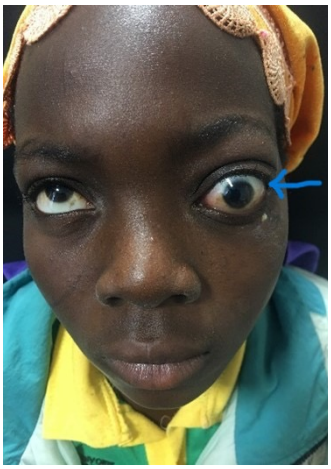

Figure 3B. Patient with the eyes in the up gaze. The arrow shows limited supra-duction of the left eye, i.e. fails to move upwards.

Figure 4. Photo displays the moment a piece of stick was retrieved from the left lateral intraconal area as indicated by the arrow.

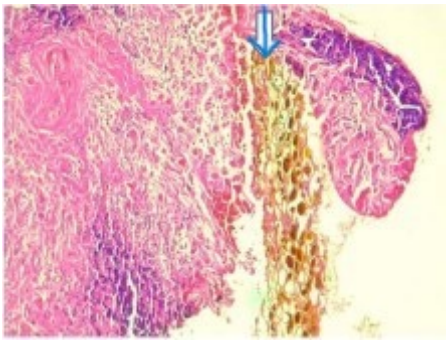

Figure 5. A section from the orbital mass showing the tract of the penetrating stick with associated granulomatous reaction as indicated by the white block arrow (X10).

intraorbital foreign body or abscess. There was, however, calcification and relative thickening of the left optic nerve. The imaged brain parenchyma appeared normal.

Surgical intervention was indicated due to the presence of proptosis, restricted ocular motility, signs of optic nerve compression, and discharging fistula, though there was no potential for improvement in vision. Explorative orbitotomy revealed a large wooden foreign body measuring 5x1x0.2 cm in the lateral intraconal area (Figure 4). It extended from the orbital apex to the posterior aspect of the globe adjacent to the full length of the intraorbital optic nerve. An incisional biopsy of the orbital tissue showed the tract of the penetrating foreign body with associated inflammatory reaction was taken and sent for histopathology (Figure 5). Post-operatively, the proptosis resolved, and the fistula closed; however, the vision remains NPL.

Discussion

Our patient presented with a penetrating left orbital injury from a wooden foreign body that became embedded adjacent to the optic nerve. She presented over one year later with painful proptosis and loss of vision associated with a discharging orbital fistula at the entry wound, which had self-sealed following attempted surgical removal. Diagnosis of intraorbital foreign bodies requires a high index of suspicion, and a detailed history is essential.[3] Srirangam et al. reported a case of an unusual intraorbital foreign body in which the point of entry was disproportionate to its size, trajectory, and final location in a symptomless patient.[5] This report has some features in common with our case. Our patient was a child, and the details and extent of the injury may have been concealed for fear of punishment. Lefebvre et al. conclude that a presentation of decreased vision, decreased motility, or neurological abnormality, particularly in children, should alert a high index of suspicion of serious injury and/or retained foreign body.[6]

An orbital CT scan is the imaging modality of choice for detecting and localizing orbital foreign bodies.[3] Despite modern imaging methods, identifying and locating organic intraorbital foreign bodies is often difficult,[7] unlike metallic foreign bodies.[1] Sometimes, wooden foreign bodies appear as aerated structures with a visible linear course and geometric structure, alerting the clinician to the possibility of an occult wooden foreign body.[6] In some cases, magnetic resonance imaging (MRI)[5] is needed to rule out organic foreign bodies, which our patients cannot afford.

Early diagnosis, surgical exploration, and extraction of intraorbital foreign body, when indicated, significantly improve the outcome and the visual prognosis.[3] Unfortunately, this patient presented with irreversible visual loss one year after the initial injury. An explorative orbitotomy may be done under general anaesthesia to reveal additional foreign bodies after what is thought to be an adequate investigation. This often resolves the preoperative concerns[5] as pertains to this case. Unlike organic intraorbital foreign bodies, their nonorganic counterparts, such as metals, can be well tolerated and may not require surgical intervention despite proximity to essential structures.[8,9] However, exceptions include copper materials, which have been reported to cause purulent inflammation; iron, which can cause siderosis; and lead, which can cause systemic toxicity.[10] 11]

Conclusion

Given the history of trauma by a stick, proptosis, restricted motility, signs of optic nerve compression, and orbital fistula, surgical intervention was indicated. A high index

of suspicion must always be entertained in such cases, and explorative orbitotomy should be performed early enough to protect sight. This case seeks to raise awareness about stick injuries in children and encourage early surgical intervention, which could save sight when there is a high index of suspicion. Many patients remain asymptomatic for years before presentation, as in this case.

Conflict of interests: None.

Contributions: GBB was the operating surgeon who conceptualised the idea and wrote the original draft. MAR prepared the histological slides. EMD reported the histological slides. All authors proofread and approved the manuscript. All images from the authors with permission from the patient.

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Malaria takes a step closer to eradication in Africa

Patrick Ashinze[1]

Patrickashinze@yahoo.com

Matthew Olamide Olaniyan[1]

Olamideolaniyan@gmail.com

Oluwadamilare Olatunbosun[2]

Dare.olat@yahoo.com

1. Faculty of Clinical Sciences, University of Ilorin Teaching Hospital, Ilorin, Nigeria

2. Obafemi Awolowo University Teaching Hospital, Ife, Nigeria

Dear Editor,

Nearly a century after launching proactive, eradicative efforts, Egypt, a North African nation of ancient and modern significance, became certified malaria-free on the 20th of October, 2024 by the World Health Organisation (WHO).[1] This makes Egypt the fifth African nation(after Mauritius, Algeria, Cabo Verde and Morocco) to achieve the historic rank and the third of such in the eastern Mediterranean region.[2] This trendsetting stride coincides with the period GAVI, The Vaccine Alliance donated and shipped in one million R21 malaria vaccines into Nigeria, a move that throttled the train of malarial eradication much closer to the end of the lit tunnel.[3]

Hailed as a testament to the commitment of Egyptians towards ridding themselves of an ancient scourge by Dr Tedros Ghebreyesus, The WHO Director-General, the certified recognition is the culmination of decades of strategic interventions and policymaking - from vector control approaches to effective case management and to nationwide awareness campaigns.[1]

Malaria is a disease as ancient as the Pharaohs and the pyramids. Globally and annually, it kills over 600,000 people, the bulk of which are children under the age of five.[4] Egypt's success story sets a president. It serves not only as a reflection of the nation's focused commitment to public health and research but also as a light bearer for other malaria-endemic nations in the Middle East and North African (MENA) region and in sub-Saharan Africa where over 90% of malarial cases are recorded yearly.[4]

It demonstrates that sustained political will, effective health policies, and multinational collaboration that birthed initiatives like Roll Back Malaria(RBM) can lead to eradication, even in regions with complex sociocultural, socioeconomic, and socio-environmental factors. Therefore, other nations in Africa have no choice than to make this a rubicon cross too.

While Egypt celebrates her enviable feat, the broader global fight against malaria saunters on. The introduction of the Oxford R21 vaccine into countries like Nigeria represents another vital step forward towards sounding a death knell for malaria. However, there is more to becoming malaria-free. The status must be rigorously and meticulously guarded and maintained so as not to revert to the previous situation. With continued and aggressive investment in preventive measures like vaccination, research, and local healthcare initiatives, the vision of a malaria-free Africa edges closer to reality compared to decades ago when it was almost wishful thinking.

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Dr Stephen Cizario Odu Hakim

A pioneer, tutor and mentor

As South Sudanese medical consultants have increased in the different specialties over the last several years, anaesthesiology has remained one of the rarest specializations. Dr Stephen Cizario Odu Hakim, aka Akeri, was among the few who took the step to specialize in anaesthesia and excelled in it.

Dr Stephen was born in Khartoum, Sudan, on 29 March 1979 to Cizario Odu Hakim of the Madi clan of Pandikeri of Opari Eastern Equatoria State and Mama Asunta Sadia.

He attended Juba Model Primary School from 1990 to 1998 and completed his secondary school certificate at Comboni Secondary School in Juba, South Sudan 2002.

Dr Stephen attended the University of Bahr el Ghazal College of Medicine and graduated with an MBBS degree in 2010.

In 2017, Dr Stephen obtained his Master of Medicine in Anaesthesia from Muhimbili University of Health and Allied Sciences in Dar es Salaam, Tanzania.

As one of the pioneers in anaesthesiology, his colleagues described him as a mentor, tutor, and dedicated servant. He impacted the lives of many young doctors who looked up to him.

He worked in several cities, including Juba, Raja, and Wau, where he is remembered as a hardworking and committed doctor.

Dr Koma Akim, his cousin, who is a general surgeon, has this to say about Dr Stephen: "Dr Akeri loved his work. He dedicated himself to providing anesthesia services to women and girls who underwent obstetrics fistula surgery repairs at Juba Teaching Hospital and the Lutheran Reconciliation Hospital, Hai Referendum, Juba. He loved his work so much that even though he was ill, he still cared for his patients. He once told me that 'work is for the living.' His work ethic encapsulated his beliefs, and he worked until his last moments."

Dr Stephen passed away on 27 August 2024 after battling cancer for many years. He is survived by his wife, Gune Tongun Ladu Rombe, and their son and three daughters.

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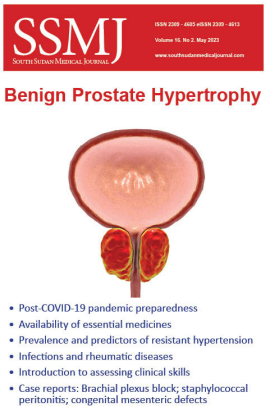

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