

## **Malaria vaccine: a new tool in the fight against malaria**

- The South Sudan Medical Journal: Keep it up
- Predictors of fetal macrosomia: a case-control study
- Association between body mass index and foot ulcer
- Tobacco smoking: dental health professionals role
- Neuroscience education in Africa
- Acetaminophen poisoning and puerperal sepsis
- Training and mothers delivery in health facilities

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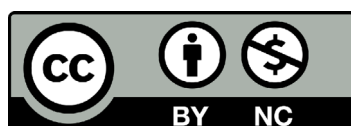
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**FRONT COVER:** A thick film human blood smear, extracted from a patient with a malarial infection, revealed the presence of a number of lightly-staining, ring-staged, *Plasmodium falciparum* trophozoites (CDC Image Bank)

# Malaria vaccine: a new tool in the fight against malaria

**Dr Edward Eremugo Kenyi**

Editor-in-Chief, South Sudan Medical Journal

In early October 2021 the World Health Organization (WHO) recommended the use of the first-ever malaria vaccine for children aged under 5 in sub-Saharan Africa and other regions with moderate to high *P. falciparum* malaria transmission - this is welcome news in South Sudan.<sup>[1]</sup>

The whole of South Sudan is endemic for malaria, with high transmission in the country throughout the year. Malaria is the leading cause of illness and death in children under five years. In 2019, the malaria incidence (all ages) was estimated at 246 per 1,000 populations (239 per 1,000 for children under-five-years) representing 5,067,464 cases.<sup>[2]</sup>

The main methods deployed against malaria are malaria case management (early diagnosis and treatment), Insecticide Treated Nets (ITN), Indoor Residual Spray (IRS) and chemoprevention methods such as Intermittent Preventive Treatment of Malaria in Pregnant Women (IPTp) and Seasonal Malaria Chemoprevention (SMC) among others.

Despite the universal coverage in ITNs and usage of IRS in targeted areas of South Sudan, and the scale up of malaria diagnosis and treatment, current evidence shows that these core interventions have not had significant impact to interrupt malaria transmission.<sup>[2]</sup> The 2017 Malaria Indicator Survey showed that only about 41.7% of children aged under five years had slept under an ITN the previous night, and that only 27% of households owned at least one ITN for every two people.

The malaria vaccine is an added tool in the arsenal deployed against malaria. When used in combination with the other prevention methods, the malaria vaccine can be highly effective.<sup>[3]</sup>

The vaccine, known by the acronym RTS,S, is the first malaria vaccine shown to provide partial protection against malaria in children under five, and is the first-ever vaccine against a human parasite recommended for use by WHO, following long-running clinical trials in Kenya, Ghana and Malawi. (See infographic on page 152) According to WHO, the vaccine should be provided in a schedule of 4 doses in children from 5 months of age in order to reduce malaria disease.<sup>[1]</sup>

For South Sudan, it is time to add the vaccine to the malaria strategy and plan a roll out and implementation guidelines. There is no time to waste.

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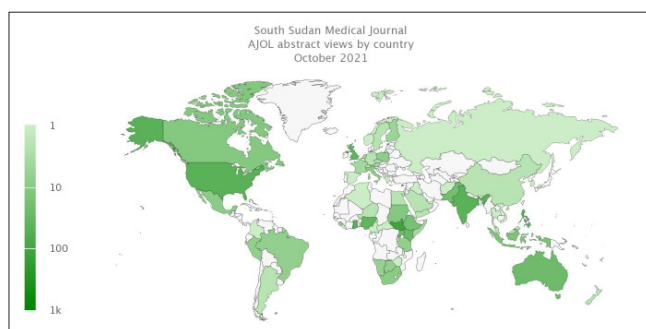
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# The South Sudan Medical Journal: Keep it up

**Peter Newman**

Consultant Neurologist, Previously RCP Associate Medical Director (Africa)

As an avid reader since 2008 of the South Sudan Medical Journal, always interested in the reports, reviews and research papers, I am delighted to have the opportunity to express, on behalf of the readership, our gratitude to the Editor-in-Chief, Editors and Associate Editors, Editorial Adviser and Assistants, and the Production Team for consistently in every quarterly issue, presenting a breadth of medical educational material. This leads to the development of skills and knowledge to improve our clinical practice especially, but not exclusively, in the key setting of South Sudan.



The current issue (the 56th) contains a report on the readership which shows how this has steadily increased, how the Journal has been recognised and read in every Continent, and yet maintained its core emphasis, aim and mission relating to the healthcare professionals of South Sudan and the nearby countries. Readers and followers of the Journal over the years will have seen how it has grown, broadened its coverage, become more mature and sophisticated in its appearance and content, and placed itself in a very satisfactory ranking alongside other medical journals concerned with or derived from clinical practice in Africa.

What does the Journal do particularly well? I can list a number of features. Its striking covers, internal lay out, style and catching illustrations each attract the reader to its content. The focus on contemporary health issues concerning particularly South Sudan. The “How to do it” articles which are so helpful to those doctors and nurses practising away from peer support networks, but perhaps equally beneficial in their authoritative practicality to any practitioner. The reviews of selected matters, for instance on Malaria in the December 2020 issue, are especially important. The continuing flow of sometimes nuanced but always relevant research papers are of note. I could go on...

How may the South Sudan Medical Journal grow and improve in the future? The simple answer is more of the same. The Journal provides an on-line and accessible free facility which matches many other better known comparators and gives the opportunity for publication of research material to those working in more isolated situations as well as those in more usual research environments. It is important that regular topical review articles are commissioned and published. There is an almost inexhaustible field of “How to do it” topics which are rightly popular and of great practical benefit and should continue to be commissioned and feature in every issue – and could perhaps be compiled into a separately accessible window in the website of the Journal. It is essential to maintain the prime focus of the Journal on South Sudan, but the involvement, as contributors and readers, of those outside South Sudan both locally and from more of a distance, should continue to be encouraged.

The mission of the Journal is “to publish research and clinical guidance that will positively influence the development of healthcare services in South Sudan and beyond”. Congratulations to all those who are involved with the successful fulfilment of this mission.

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# Predictors of fetal macrosomia in Iringa, Tanzania: a case-control study

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## Abstract

**Introduction:** It is challenging to predict fetal macrosomia before delivery. This study aimed at assessing predictors of fetal macrosomia at Iringa Regional Referral Hospital in Tanzania from June to December 2020.

**Method:** An unmatched case-control study with 216 participants of whom 72 were cases - women who delivered babies weighing  $\geq 4000\text{g}$  - and 144 were controls - women who delivered babies weighing 2500g to 3499g. The purposive sampling technique described below was employed to recruit both controls and cases. SPSS version 25 software program was used for data entry and analysis.

**Results:** Of the 216 participants, 116 (53.7%) were aged between 25 – 34 years (standard deviation 6.0). The majority of 132 (61.1%) delivered at a gestational age of 37 – 39 weeks + 6 days of whom 17 (23.6%) were cases and 115 (79.86%) were controls. The predictors of fetal macrosomia were advanced gestation age (AOR=8.10, 95% CI 3.66-17.91,  $p<0.0001$ ) and diabetes mellitus during pregnancy (AOR =14.94, 95% CI 1.60 -39.91,  $p=0.0178$ ).

**Conclusion:** Women with higher gestational age and gestational diabetes mellitus are at an increased risk of delivering a baby with macrosomia at Iringa Regional Referral Hospital. An early plan for the mode of delivery, such as labour induction, will aid the prevention of advanced gestational age. Ensuring a healthy diet and physical exercises in our communities will help to reduce diabetes mellitus and hence fetal macrosomia.

**Keywords:** Macrosomia, Predictors, Tanzania

## Introduction

Fetal macrosomia is widely defined as a birth weight of  $\geq 4000\text{g}$  or birth weight greater than the 90th percentile at birth.<sup>[1]</sup> The worldwide prevalence of fetal macrosomia is 0.5% to 15% of all pregnancies.<sup>[2]</sup> The prevalence in developed countries ranges from 15 – 20% due to excess nutritional intake, obesity, and diabetes mellitus.<sup>[1]</sup> In Africa, the prevalence ranges from 2% to 9% and the reasons include multiparity and variations in maternal weight gain during pregnancy.<sup>[1,3-5]</sup>

The predictors of fetal macrosomia studied to date include a previous history of delivering a macrosomic baby, multiparity, male fetus, uncontrolled diabetes mellitus, gestational diabetes, gestational age, maternal weight gain during pregnancy, parental height, post-term pregnancy, and ethnicity.<sup>[2,6]</sup> Fetal macrosomia has been linked to adverse maternal and fetal outcomes such as postpartum haemorrhage, the leading cause of maternal mortality, and neonatal death.<sup>[3,7]</sup> The gold standard for diagnosing fetal macrosomia is magnetic resonant imaging (MRI) which is rarely available at many facilities in developing countries.<sup>[6]</sup> Clinical examination and obstetric ultrasound are less accurate compared to MRI.<sup>[6,8]</sup> This study aimed to assess the predictors of fetal macrosomia in Iringa, Tanzania.

## Method

A hospital-based unmatched case-control study was designed involving term pregnant women with a singleton birth at the Department of Obstetrics and Gynaecology at Iringa Regional Referral Hospital from June to December 2020. A total of 216 women were included of whom the 72 who delivered babies weighing  $\geq 4000\text{g}$  were considered as cases and the 144 women who delivered babies weighing 2500g to 3499g were taken as controls. The reasons for selecting these weight groups is:

1. Cases (macrosomic group) - women who delivered babies of birthweight of 4000g and above. This agrees with the globally standard accepted definition of fetal macrosomia.
2. Controls (normal weight babies) - women who delivered babies of 2500g to 3499g, the cut-off lower limit was 2500g because below 2500g is a 'low

birth weight' and in Tanzania, 3500g and above are considered as big babies /macrosomia.

We used a modified [World Health Organization criteria](#) to diagnose diabetes mellitus during pregnancy. A 2-hour 75g oral glucose tolerance test (OGTT) was used. Study participants who were known to be diabetic were not included in the test. Participants were required to fast for a minimum of 8 hours before the test, the fasting blood glucose was obtained. After 2 hours of taking the oral glucose, blood glucose was measured. All women with a fasting plasma glucose level of  $\geq 7.0\text{mmol/l}$  (126mg/dl) or a 2-hour plasma glucose of  $\geq 11.1\text{mmol/l}$  (200mg/dl) were considered as women with diabetes during pregnancy

Data were analyzed using SPSS, version 25.0 (IBM Inc., Chicago). Ethical clearance was obtained from the University of Dodoma Directorate of Research and Publication and informed consent was obtained from the participants.

**Table 1. Social demographic characteristics of the participants (N=216)**

Variable	Total n=216 n (%)	Cases n=72 n (%)	Control n=144 n (%)
<b>Child characteristics</b>			
<b>Sex</b>			
Male	124 (57.4)	45 (62.5)	79 (54.9)
Female	92 (42.6)	27 (37.5)	65 (45.1)
<b>Maternal characteristics</b>			
<b>Maternal age (years)</b>			
15 – 24	64 (29.6)	11 (15.3)	53 (36.8)
25-34	116 (53.7)	44 (61.1)	72 (50.0)
35+	36 (16.7)	17 (23.6)	19 (13.2)
<b>Residence</b>			
Rural	94 (43.5)	30 (41.7)	64 (44.4)
Urban	122 (56.5)	42 (58.3)	80 (55.6)
<b>Parity</b>			
1	73 (33.8)	15 (20.8)	58 (40.3)
2	66 (30.6)	19 (26.4)	47 (32.6)
3	44 (20.4)	18 (25.0)	26 (18.1)
4+	33 (15.3)	20 (27.8)	13 (9.0)
<b>Gestation age (weeks)</b>			
37 – 39 weeks +6 days	132 (61.1)	17 (23.6)	115 (79.9)
40 – 41weeks +6 days	68 (31.5)	45 (62.5)	23 (16.0)
42+	16 (7.1)	10 (13.9)	6 (4.2)
<b>Level of education</b>			
No formal education	34 (15.7)	12 (16.7)	22 (15.3)
Primary	106 (49.1)	28 (38.9)	48 (33.3)
Secondary and above	76 (35.2)	32 (44.4)	74 (51.4)

Table 2. Predictors of fetal macrosomia (N=216)

Variable	Macrosomia		X <sup>2</sup>	p-value
	Case n=72	Control n=144		
<b>Child's characteristics</b>				
<b>Sex</b>			1.1455	0.285
Male	45 (62.5)	79 (54.9)		
Female	27 (37.5)	65 (45.1)		
<b>Maternal factors</b>				
<b>Age - years</b>			11.7363	0.003
15 – 24	11 (15.3)	53 (36.8)		
25-34	44 (61.1)	72 (50.0)		
≥35	17 (23.6)	19 (13.2)		
<b>Residence</b>			0.1507	0.698
Rural	30 (41.7)	64 (44.4)		
Urban	42 (58.3)	80 (55.6)		
<b>Gestation age - days</b>			63.9846	<0.0001
37 – 39	17 (23.6)	115 (79.9)		
40 - 41(+6 days)	45 (62.5)	23 (16.0)		
42+	10 (13.9)	6 (4.2)		
<b>Maternal Body Mass Index (kg/m2)</b>			0.8827	0.643
18.5- 24.9	27 (37.5)	51 (35.4)		
25.0-29.90	27 (37.5)	59 (41.0)		
≥ 30.0	18 (25.0)	30 (20.8)		
<b>Previous history of delivering a macrosomic baby</b>			30.4912	<0.0001
Yes	35 (48.6)	20 (13.9)		
No	37 (51.4)	124 (86.1)		
<b>Diabetes Mellitus</b>				<0.0001*
Non diabetic	62 (86.1)	143 (99.3)		
Diabetic	10 (13.9)	1 (0.7)		
<b>Parity</b>			18.1653	<0.0001
1	15 (28.4)	58 (40.3)		
2	19 (26.4)	47 (32.6)		
3	18 (25.0)	26 (18.1)		
4+	20 (27.8)	13 (9.0)		
<b>Weight gain during pregnancy (kg)</b>			0.7648	0.382
≤11	38 (52.8)	85 (59.0)		
>11	34 (47.2)	59 (41.0)		

p-value with \* indicates p-value calculated by the Fisher exact test



## Results

There were 79 (54.9%) male babies and 65 (45.1%) female babies. The mean age of the 216 mothers was 28.5 years (standard deviation 6.0 years); 116 (53.7%) of participants were aged between 25 – 34 years of whom 44 (61.1%) were cases and 72 (5%) were controls. Seventy-eight (33.8%) were primiparous of whom 15 (20.83%) were cases and 58 (40.28) were controls. Table 1.

### The predictors of fetal macrosomia

This study found that, among the maternal factors, gestation age  $\geq 40$  weeks (p-value =  $< 0.0001$ ), a previous history of macrosomic baby (p-value =  $< 0.0001$ ), diabetes mellitus in pregnancy, higher parity (p-value =  $< 0.0001$ ) and higher maternal age (p-value =  $0.0028$ ) were predictors of fetal macrosomia on cross tabulation as shown in Table 2.

In this study, women with advanced gestation age ( $\geq 40$  weeks) were eight times more likely to give birth to a macrosomic baby compared to women who delivered at a gestation age of 37 to 39 weeks (AOR=8.10, 95% CI=3.66-17.91,  $p < 0.0001$ ). Women with diabetes mellitus were 14 times more likely to give birth to a

macrosomic baby compared to women without diabetes mellitus (AOR=14.94, 95% CI=1.60-39.91,  $p=0.0178$ ) as shown in Table 3.

## Discussion

In Taiwan and Indonesia, fetal macrosomia has been associated with maternal overweight and obesity.<sup>[10,11]</sup> This is contrary to the finding in this study in which body mass index did not predict fetal macrosomia. Although not statistically significant, excessive weight gain before and during pregnancy has been linked to decreasing insulin sensitivity which facilitates the transfer of glucose via the placenta to the growing fetus hence leading to increasing fetal size.<sup>[11,12]</sup> These two studies were cohort studies conducted for a longer duration and with a larger sample size compared to our study. This may explain why BMI was significantly associated in their study and not in ours.

The predictors of fetal macrosomia in Malaysia included increasing maternal age, increasing BMI, increasing weight gain during pregnancy, higher parity, and diabetes mellitus during pregnancy.<sup>[14]</sup> In this study advanced maternal age, maternal BMI, maternal weight gain

**Table 3. Logistic regression of factors associated with fetal macrosomia (N=216)**

Variable	OR	95% CI OR		p-value	AOR	95% CI AOR		p-value
		Lower	Upper			Lower	Upper	
<b>Maternal Age (years)</b>								
15-24	Ref.							
25-34	2.94	1.39	6.23	0.0048	1.75	0.65	4.71	0.2666
$\geq 35$	4.31	1.72	10.84	0.0019	1.04	0.26	4.234	0.9584
<b>Gestation age</b>								
37 – 39	Ref.							
40 - 41(+6 days)	13.24	6.47	27.07	$< 0.0001$	8.10	3.66	17.91	$< 0.0001$
$\geq 42$	11.28	3.63	35.01	$< 0.0001$	8.67	2.53	29.74	0.0006
<b>Parity</b>								
1	Ref.							
2	1.56	0.72	3.41	0.2608	1.02	0.38	2.75	0.9713
3	2.68	1.17	6.12	0.0196	1.47	0.47	4.60	0.5072
4+	5.95	2.42	14.63	0.0001	1.78	0.46	6.94	0.4068
<b>History of delivery of a macrosomic baby</b>								
No	Ref.							
Yes	5.87	3.03	11.36	$< 0.0001$	2.34	0.90	6.09	0.0815
<b>Diabetes mellitus</b>								
Non-diabetic	Ref.							
Diabetic	0.04	0.01	0.35	0.0031	14.94	1.60	39.91	0.0178

during pregnancy, and higher parity were not associated with fetal macrosomia although diabetes mellitus during pregnancy was strongly associated. Ours was a case-control study with only 216 participants while in Malaysia it was a cross-sectional study with 2332 participants, a difference that may explain why findings differ. Diabetes mellitus during pregnancy leads to increasing fetal adiposity hence an increase in fetal weight leading into macrosomia.<sup>[14]</sup>

Advanced gestation age was the commonest predictor of fetal macrosomia in this study and is similar to findings in Sydney in which it was estimated that a fetus gains 176.5g per week; this may explain why advanced gestation age predisposes a woman to deliver a macrosomic baby.<sup>[15]</sup>

In Tanzania and Ethiopia, the predictors of fetal macrosomia were a maternal weight above 80kg, multiparity, diabetes mellitus during pregnancy, and maternal pre-pregnancy BMI and pregnancy weight gain respectively while maternal age and previous history of delivering a macrosomic baby were found in both studies.<sup>[5,9]</sup> These findings are at variance with those in our study where only higher gestation age and gestational diabetes mellitus during pregnancy were significantly associated with fetal macrosomia.

Efforts to prevent diabetes mellitus which may result in fetal macrosomia should be one of the community interventions. Diabetes mellitus can be prevented by first ensuring a healthy balanced diet in our communities and also by educating families on physical exercises. It is best for women with advanced gestation age who are at risk of fetal macrosomia to seek care early and the mode of delivery determined. Early labour induction or a possible Caesarean Section play an important role in preventing dangerous obstetric outcomes of fetal macrosomia.

## Conclusion

Women with higher gestational age and gestational diabetes mellitus are at an increased risk of delivering a baby with macrosomia at Iringa Regional Referral Hospital. An early plan for the mode of delivery, such as labour induction, will aid the prevention of advanced gestational age. Ensuring a healthy diet and physical exercises in our communities will help to reduce diabetes mellitus and hence fetal macrosomia.

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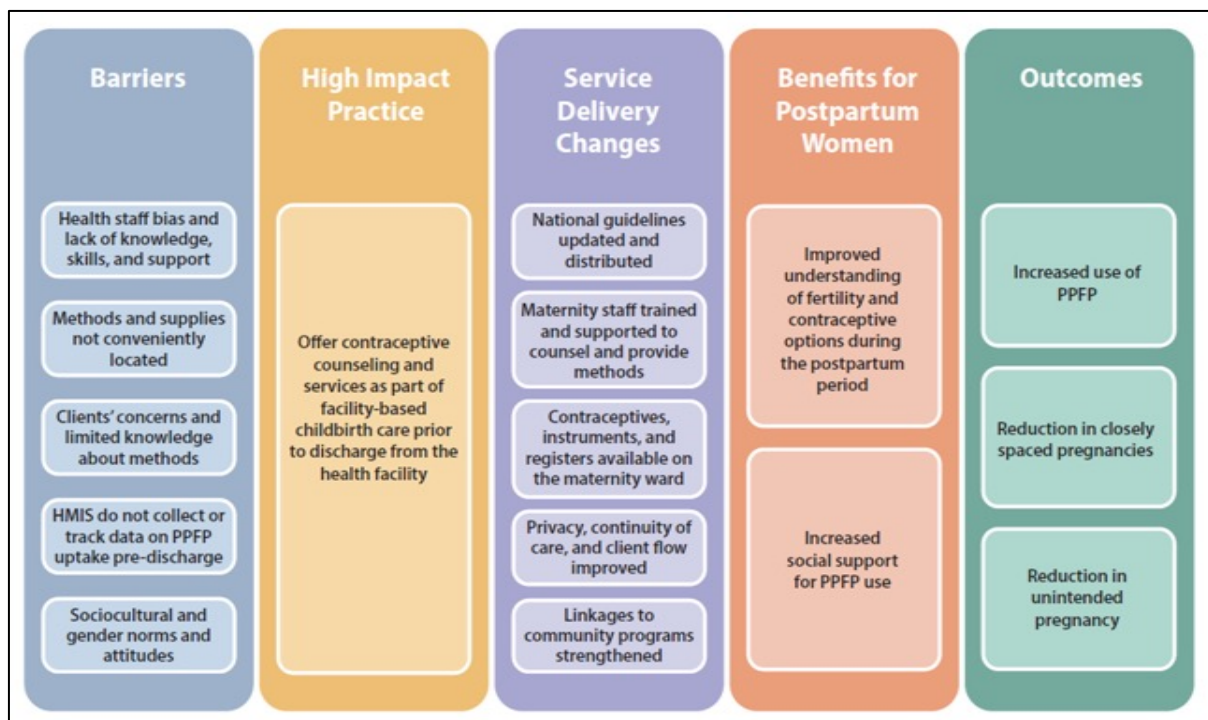
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## High Impact Practices in Family Planning

This High Impact Practices in Family Planning (HIP) brief summarizes the evidence and provides implementation tips for proactively offering family planning as part of care during and immediately after childbirth, often referred to as the immediate postpartum period.



High Impact Practices (HIPs) are a set of evidence-based family planning practices vetted by experts against specific criteria and documented in an easy-to-use format. <https://www.fphighimpactpractices.org/high-impact-practices-in-family-planning-list/>

And <https://www.fphighimpactpractices.org/>

# The association between body mass index and foot ulcer among patients with diabetes mellitus, Wad Medani, Sudan

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## Abstract

**Introduction:** Globally about 463 million people are living with diabetes mellitus (DM) which is estimated to rise to 700 million by 2045; 80% are in middle and low-income countries. Recent studies have shown that body mass index (BMI) was one of the significant predictors, along with nephropathy and retinopathy, of diabetic foot ulcers (DFU).

**Objective:** To assess the association between BMI and DFU in Wad Medani town, Gezira state, Sudan.

**Method:** The study was based on primary data obtained via a cross sectional random sample of 400 patients with DM presenting at Aldarga Diabetic Centre in Wad Medani. The data collection tool was a structured questionnaire designed in English and translated into Arabic for the field survey. Data were analysed with SPSS version 20, using frequency tables and chi-square tests.

**Results:** Of the 400 participants, 208 were diagnosed with foot ulcer. There was a statistically significant association between BMI and DFU. A total of 134 (56%) of the 239 overweight patients had diabetic foot ulcers compared to 74 (46%) of the 161 who were not overweight ( $p=0.04$ ).

**Conclusion:** The result suggests a significant association between BMI and DFU at our Diabetic Centre.

**Keywords:** diabetes, diabetic foot ulcer, body mass index, Gezira, Sudan

## Introduction

Globally about 463 million people are living with diabetes mellitus (DM) and 80% are in middle and low-income countries. The International Diabetes Federation has estimated that the number of diabetes patients will rise to 700 million by 2045. Almost half of adult type-2 diabetes patients are unaware they have this disease and 185.8 million undiagnosed diabetics are in middle-income countries.<sup>[1]</sup> Worldwide every 30 seconds, a lower limb is lost because of diabetes. The incidence of DFU amongst those with DM is 2% (9.26 million) but the risk of recurrence for those with a history of DFU increases to 17–60% over the following three years.<sup>[2]</sup>

The prevalence of DM is expected to increase alarmingly in Africa. It is estimated that around 20 million Africans are now living with DM presenting a serious challenge for health systems now and in the future. A study in urban populations of the River Nile State, north Sudan, gave a prevalence of DM of 19.1%; a high proportion of the patients were undiagnosed.<sup>[3]</sup>

Diabetic foot disease in Africa is also a growing problem and is associated with a high mortality. A meta-analysis reported data from 19 African countries on 56,173 diabetic patients with a prevalence of foot ulcers of 13%, which increased over time, especially since 2001. Approximately 15% of patients with foot lesions

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underwent major amputation and 14.2% died in hospital.<sup>[4]</sup> In a 2017 study in Khartoum the occurrence of DFU was 18.1%.<sup>[5]</sup>

A study of DM patients in Ethiopia<sup>[6]</sup> showed a relatively high incidence of DFU (4 per 100 person-years). A high body mass index (BMI) was one of the significant predictors, along with nephropathy and retinopathy. However, a meta-analysis in 2017<sup>[7]</sup> concluded that lower BMI was associated with higher risk of DFU.

Although, as yet, few studies have investigated its global epidemiology, diabetic foot is a severe public health issue and close monitoring of patients is essential to reduce DFU.

This study, as far as we know, may be the first to estimate the association between BMI and DFU among patients with DM, in Wad Medani, Sudan.

### Definitions

- The [International Working Group on the Diabetic Foot](#) has defined the diabetic foot as “infection, ulceration, or destruction of tissues of the foot of a person with currently or previously diagnosed diabetes mellitus, usually accompanied by neuropathy and/or peripheral arterial disease (PAD) in the lower extremity.”
- Diabetic foot ulcers are non-traumatic lesions of the skin on the foot distal to the malleoli.
- Body Mass Index (BMI) = body weight (kg) divided by the height (m<sup>2</sup>). In adults BMI of <18.5 = underweight, 18.5–<25 = normal range and ≥25.0 = overweight.
- [Diagnostic criteria for diabetes mellitus](#): Random plasma glucose ≥200 mg/dL (≥11.1 mmol/L) or 1 fasting plasma glucose value of ≥126 mg/dL (≥7.0 mmol/L) or 2-h. Oral glucose (100grams) tolerance test (GTT) value in venous plasma ≥200 mg/dL (≥11.1 mmol/L) glycated haemoglobin (HbA1c) ≥6.5% (≥48 mmol/molHb).

### Ethical Aspects

Ethical approval for the study was given by the Director of Health Affairs, Wad Medani. Permissions for data collection were obtained from the centre managers, and oral informed consent from the study participants after assuring them of the confidentiality of their data.

### Method

This was a cross-sectional study among patients needing specialized care attending for follow-up at Aldarga Diabetic Health Centre in Wad Medani Town, Gezira State, Sudan from September to December 2020. The Centre is in the north of Wad Medani town, 186 kilometres south of Khartoum. It opened in 2007 as a specialized Diabetic

**Table 1. Demographic characteristics**

Characteristics	Characteristics	n (%)
<b>Age range (years)</b>	30-39	25 (6.2)
	40-49	59 (14.8)
	50-59	103 (25.8)
	60-69	105 (26.2)
	70-79	90 (22.5)
	80-89	18 (4.5)
<b>Sex</b>	Male	222 (55.5)
	Female	178 (44.5)
<b>Residence</b>	Town	225 (56)
	Village	175 (44)
<b>Type of family</b>	Nuclear	168 (42)
	Extended	232 (58)
<b>Income level</b>	Low	134 (33.5)
	Medium	232 (58)
	High	34 (8.5)
<b>Marital status</b>	Single	27 (6.8)
	Married	277 (69.2)
	Widow	72 (18)
	Divorced	24 (6)
<b>Type of work of respondent</b>	Professional / Business	64 (16)
	Contracted Employee	35 (8.8)
	Other Employee	15 (3.7)
	Farmer	20 (5)
	Housewife	54 (13.5)
	Other	60 (15)
	Unemployed	152 (38)
	<b>Educational level</b>	Illiterate
Khalwa/Madrasa	77 (19.3)	
Basic	159 (39.8)	
Secondary	81 (20.2)	
University/ Postgraduate	49 (12.2)	
<b>Total</b>		<b>400 (100)</b>

Centre for the Central Region. So, the sampled population was not representative of the general population.

### Sample size and sampling

We calculated that a sample size of 400 would be adequate to show a difference in prevalence of DFU between low/normal BMI and high BMI patients. The number of diabetic patients who reported to the Centre

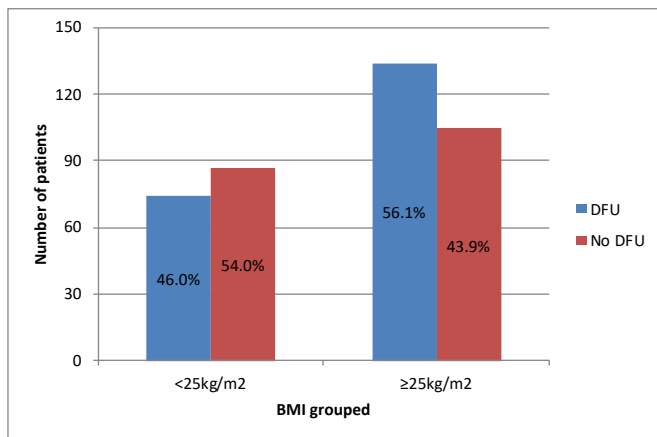


Figure 1. Relationship between BMI and DFU

in 2020 was 40,507. First, we calculated the systematic sampling interval factor by dividing the total number of diabetic patients during the data collection period (November-December 2020) by the sample size i.e.,  $N/n = 1823/400 = 4.55 \approx 5$ . The sample unit number 5 was selected.

Then, patients presenting to the centre during November and December 2020, were randomly selected, separately by sex, until we achieved our desired sample size of 400. Fewer patients than usual attended during these months due to the COVID-19 pandemic, so our sample may not be completely representative of all the patients attending the Centre. All the selected patients agreed to take part in the study.

Table 2. Diabetic specific variables for further research

Variable	Response	DFU		Total
		Yes	No	
Diabetic in the family	Yes	108	86	194
	No	100	106	206
Knowledge of caring for foot wound	Yes	191	179	370
	No	17	13	30
Wearing diabetic shoes	Yes	136	102	238
	No	72	90	162
Other wounds	Yes	52	44	96
	No	156	148	304
Feeling better since going to doctor	Yes	195	178	373
	No	13	14	27
Having leg or foot disability	Yes	53	79	132
	No	155	113	268
Type of disability	Functional	24	42	66
	Muscle	28	35	63
	Wound	1	2	3
Duration of disability	<12months	9	17	26
	1-<5 years	24	21	45
	≥5, years	20	41	61
Disability effect (e.g., psychological impact, financial impact)	Yes	23	46	69
	No	30	33	63
Foot or toe amputation	One	14	11	25
	More than one	36	54	90
	No amputation	158	127	285
Foot amputation	Yes	18	33	51
	No	190	159	349
<b>Total</b>		<b>208</b>	<b>192</b>	<b>400</b>

## Data collection

Data were collected by field data collectors using a structured questionnaire, mainly adapted from [World Health Organization](#) and [other](#) publications, written in English and then translated into Arabic. It was pretested on 8% of the total sample size and internal consistency measured under reliability by calculating Cronbach's Alpha coefficient. (The value of Cronbach's Alpha coefficient was greater than 90%).

Four hundred participants were recruited by the field data collection team, which consisted of the principal researcher, and 21 field data collectors who were paramedics working in the Centre and trained for 10 days on data collection methods and the interview/observation methodology. The training focused particularly on the anthropometric data collection. The presence or not of DFU was reported by the patient, and it was not recorded whether or not this was a first occurrence or a reoccurrence. Quality of collected data was checked by three well-trained paramedical staff who entered the data in SPSS program.

## Population

The participants were selected from all the adult ( $\geq 18$  years) diabetic patients at the follow-up clinic at Aldarga Diabetic Centre, but those who were seriously ill, gestational diabetic, diabetic patients who had traumatic ulcer, or clinically suspected of having Charcot foot were excluded. Data were coded and entered into a computer using two versions (24.0/25.0) of the Statistical Package for Social Sciences (SPSS) for Windows.

## Results

Table 1 shows that of the 400 sampled, 55% were males and 45% were females, 58% lived in extended families and 56% lived in towns. Income was based on participants' reports; 9% reported having a high income, 58% reported a medium income, and 33% a low income and showing that diabetic patients reporting to Aldarga Centre come mostly from families having a medium to low income.

The relationship between grouped BMI and foot ulcer was evaluated using a chi-squared test and is shown in Figure 1. Overweight patients were at significantly greater risk of DFU ( $p=0.04$ , relative risk 1.22).

We also collected data on other potentially relevant variables, and this information, without statistical analysis, is presented in Table 2.

The factors in Table 2 were not included at the outset as predictor variables. Although they have been analysed statistically, and some have p-values equal to or less than 0.05, great caution is needed to interpret them as there is a 1 in 20 chance that any such variable will, simply by chance, reach "significance." Further research is therefore needed.

## Discussion

Our sample may not have been representative of all the diabetic patients attending the Aldarga Diabetic Health Centre in Gezira, especially as data were collected during the COVID-19 pandemic. We chose to treat BMI as a two-level categorical variable, but we may have obtained a different result treating it as a continuous variable. We did not examine whether BMI was independently associated with DFU, or if other variables, such as glucose levels or diabetes duration could explain the association. Further analysis of our data is needed.

We are not aware of a study looking at the association between BMI and DFU in Gezira state, Sudan. Our findings are similar to those previously reported<sup>[8, 5, 9, 10]</sup> showing a strong association between a high BMI and the development of DFU. It might be that the higher the BMI the greater chance of hyperlipidaemia and vascular disease which, in turn, decreases blood supply to the lower extremities. Also, higher BMI is likely to lead to greater glucose intolerance and more severe DM with increasing vascular complications.

Although a 2017 meta-analysis study<sup>[7]</sup> that noted that "the contribution of obesity to the risk of diabetic foot ulceration is inconclusive," research by Zubair et al in India showed a positive correlation between ulcer duration and BMI, and amputation rate and BMI.<sup>[11]</sup>

Although the variables in Table 2 need further analysis the data do suggest an association between duration of diabetes and DFU (as shown in a paper from Cameroon<sup>[12]</sup> and dyslipidaemia and DFU which is similar to publications from Ethiopia, Saudi Arabia and India.<sup>[13,14,15]</sup>

A variety of foot abnormalities and disabilities appeared to have differing effects for our patients (e.g., health and economic impact) so as family doctors our responsibilities towards our society are to detect the above risk factors for DFU early and try to ameliorate them.

## Limitation of the study

There might be recall bias or reporting bias regarding the contributing factors, such as alcohol use or smoking frequency. Further, the cross-sectional nature of the study does not confirm the definitive cause and effect relationship.

## Conclusion

DFU is a serious problem in Gezira and its occurrence is increasing. Encouraging overweight patients to reduce their BMI should contribute to reducing the risk of DFU.

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# Neuroscience education in Africa, prospects and challenges

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## Abstract

This review explores the scope of neuroscience education, the current and future trends and evaluates the limitations hindering the evolution of neuroscientific studies and research in Africa.

Neuroscience is one of the most poorly addressed fields of study in Africa evidenced by the paucity of available data. Africa has a lot to do to improve neuroscience research. More government financing is needed if the continent's research sector is to continue to expand. International scientific collaborations are an important part of integrating into the global research community. African neuroscientists must also participate in policy and decision-making to urge governments to finance research into Africa's specific requirements.

**Keywords:** Neuroscience, research, publication, education, Africa

## Introduction

Neuroscience education in Africa started with the study of neuroanatomy and neurosurgery about 5000 years ago in Egypt.<sup>[1]</sup> Through the mummification process, Egyptian embalmers were the first to learn about human anatomy. They had little regard for the brain and made no attempt to preserve it.<sup>[2,3]</sup> Africa's research capability in this area has lagged behind the field's advancements.<sup>[4]</sup> This is probably due to insufficient research facilities<sup>[5]</sup>, low financing<sup>[6]</sup> and a small number of active neuroscientists.<sup>[7]</sup> These impediments stifle African research and innovation<sup>[8]</sup>, contributing to a broader 'brain drain'.<sup>[9]</sup>

Prior to formal education in neuroscience, herbal remedies for the management of mental illnesses and neurological disorders were the practice in African Countries like Nigeria. In the country's western region, concoctions known as Ajidewe and Ogun Isoye are believed to have anti-aging and memory-boosting properties.<sup>[10]</sup> Following colonialism, neurosurgery was brought to several African countries in the twentieth century and neurosurgery and neurology departments were created, although staffed by foreigners.<sup>[11]</sup> Major advances have been made in neuroscience education and research as more African scholars have taken the opportunity to receive training from institutions abroad, while those who have been trained return home to utilize the knowledge acquired.

The Merriam-Webster Medical Dictionary defines neurobiology as the science of the nervous system. It incorporates the basic sciences: physiology, anatomy, biochemistry, molecular biology and computer science in the study of neurons and neural circuits and their relationship with learning, memory, consciousness and behaviour. In addition to cellular, molecular and clinical neuroscience, other constituent branches include neurogenetics, neural imaging, neuroanatomy, computational neuroscience and social neuroscience.

Globally, neurobiology is rapidly expanding in scope, coupled with a remarkable broadening of scientific approaches and techniques as well as clinical applications. It has evolved from cellular and molecular studies of neurons to include imaging of sensory, motor and cognitive functions of the brain.<sup>[12]</sup>

### Neuroscience Education in Africa

Over the last century clinical investigations on neurogenetics and movement disorders dominated neuroscience research in Tunisia and Algeria.<sup>[13-16]</sup> The study of behavioural consequences of brain injuries and nutritional insufficiency in rats introduced basic neuroscience research to Morocco in the 1970s.<sup>[17]</sup> The closeness of North African neuroscientists to Middle Eastern and European training colleges encouraged them to continue their studies and contribute to the progress of neuroanatomy and neurosurgery.<sup>[18]</sup> In the seventeenth century, Yoruba traditional healers in Nigeria are credited with developing the earliest knowledge of neurological disorders in Sub-Saharan Africa.<sup>[19]</sup> In Nigeria, the first black African neuropsychiatrist developed a community-based approach for psychiatric patients in the 1950s.<sup>[20]</sup> Early studies in Kenya were descriptive, focusing on brain size rather than function.<sup>[21]</sup> Kenya witnessed the development of neurosurgical methods as a result of the two world wars.<sup>[22]</sup>

Neurosurgery advanced in the latter part of the twentieth century, with Kenyan neurosurgeons practicing and doing research.<sup>[22]</sup> Epilepsy, infectious diseases, stroke, and the evaluation of the potential therapeutic efficacy of indigenous plant extracts have been a focus of research in Tanzania and Cameroon.<sup>[23-29]</sup> The embryonic history of the segmented mesoderm and neural tube was the subject of South Africa's first publication on the nervous system.<sup>[30]</sup> Research on the neurophysiology of the spinal cord and on *Cannabis sativa* sparked basic and clinical progress in the 1950s and 1960s.<sup>[31-32]</sup> The number of publications from African nations, such as South Africa, Egypt, and Nigeria, has steadily increased<sup>[33]</sup> although non-African authors account for over 70% from sub-Saharan Africa.<sup>[4]</sup>

Between 1996 and 2017 a limited number of nations have dominated Africa's neuroscience publications of 5219 articles: Egypt (28%), South Africa (23%), Nigeria (11%), Morocco (8%), and Tunisia (7%). (Figure 1a) These nations account for 77% of neuroscience articles published on the continent. East African nations Kenya, Ethiopia, and Tanzania contributed 2–3% each, with Cameroon, Malawi, Algeria and Senegal, Uganda, and Ghana contributing 1–2% each. However, the number of neuroscience articles published each year in Africa's key geopolitical areas has risen dramatically during the last two decades. (Figure 1b)

The most common research areas are neurodegeneration and injury (n=2066, 34%; compared to 22% outside of Africa (OA)), techniques (n=905, 15%; OA: 16%), excitability, synapses, and glia (n=550, 9%; OA: 15%), development (n=532, 9%; OA: 16%), and physiology and behaviour (n=511, 8%; OA: 13%) (Figure 1c). In contrast, research on motivation and emotion (n=217,

4%; OA: 3% ), motor systems (n=191, 3% ; OA: 9% ), cognition (n=155, 3% ; OA: 4% ), and sensory systems (n=92, 2% ; OA: 2% ) were less common.

International collaboration is an important part of integrating the global research community.<sup>[34]</sup> Many African scholars have found it difficult to collaborate with colleagues in other countries due to a lack of funding and other obstacles.<sup>[35]</sup> This greatly affects the visibility of African neuroscience researches. African-led neuroscience researches with foreign co-authors received more citations and were published in higher Impact Factor (IF) journals, both inside Africa and abroad.<sup>[36]</sup>

International, rather than local, agencies funded most African neuroscience papers. Southern Africa was the only African area where domestic financing outnumbered international funding.<sup>[34]</sup> South Africa, the largest contributor in Southern Africa, is the only African country to invest nearly 1% of GDP in research and development, as the African Union recommended in 2007.<sup>[37]</sup> More government financing is needed to support the expansion of Africa's research industry. Local funding, in addition to, international funding, is critical for the development of a viable research culture in Africa.

Scientific success is highly dependent on access to cutting-edge research infrastructure, both technical and biological. Any plan for future research would require a knowledge of the availability and use of such tools throughout Africa. In Nigeria, none of the 153 institutions approved by the National Universities Commission (NUC) offers a neuroscience degree programme.<sup>[38]</sup> Medical students, on the other hand, take both basic and clinical neuroscience modules in some of their courses.<sup>[39]</sup>

Science-based non-profit organizations have sponsored training courses and workshops in neurosurgery, neurology, and basic neuroscience around Africa to support African neuroscientists and help build capacity for education and research.<sup>[1]</sup> In Morocco and South Africa, International Brain Research Organization African Centres for Advanced Neuroscience Training have been established. World Federation of Neurosurgical Societies recognized Centres of Excellence for teaching neurosurgeons have also been established in Nigeria, Ivory Coast, Senegal, Kenya, Zimbabwe, and South Africa.<sup>[40]</sup>

For African neuroscience to grow, it requires continued international funding, and African neuroscientists must participate in policy and decision-making in order to urge governments to finance research of Africa's specific regional requirements.<sup>[41]</sup> Increased participation in science advocacy efforts aimed at raising the visibility of African research and its relevance to both global and local issues might assist the cause of neuroscience research in Africa. This is important considering the genetic variation within the continent, which can aid the understanding of global

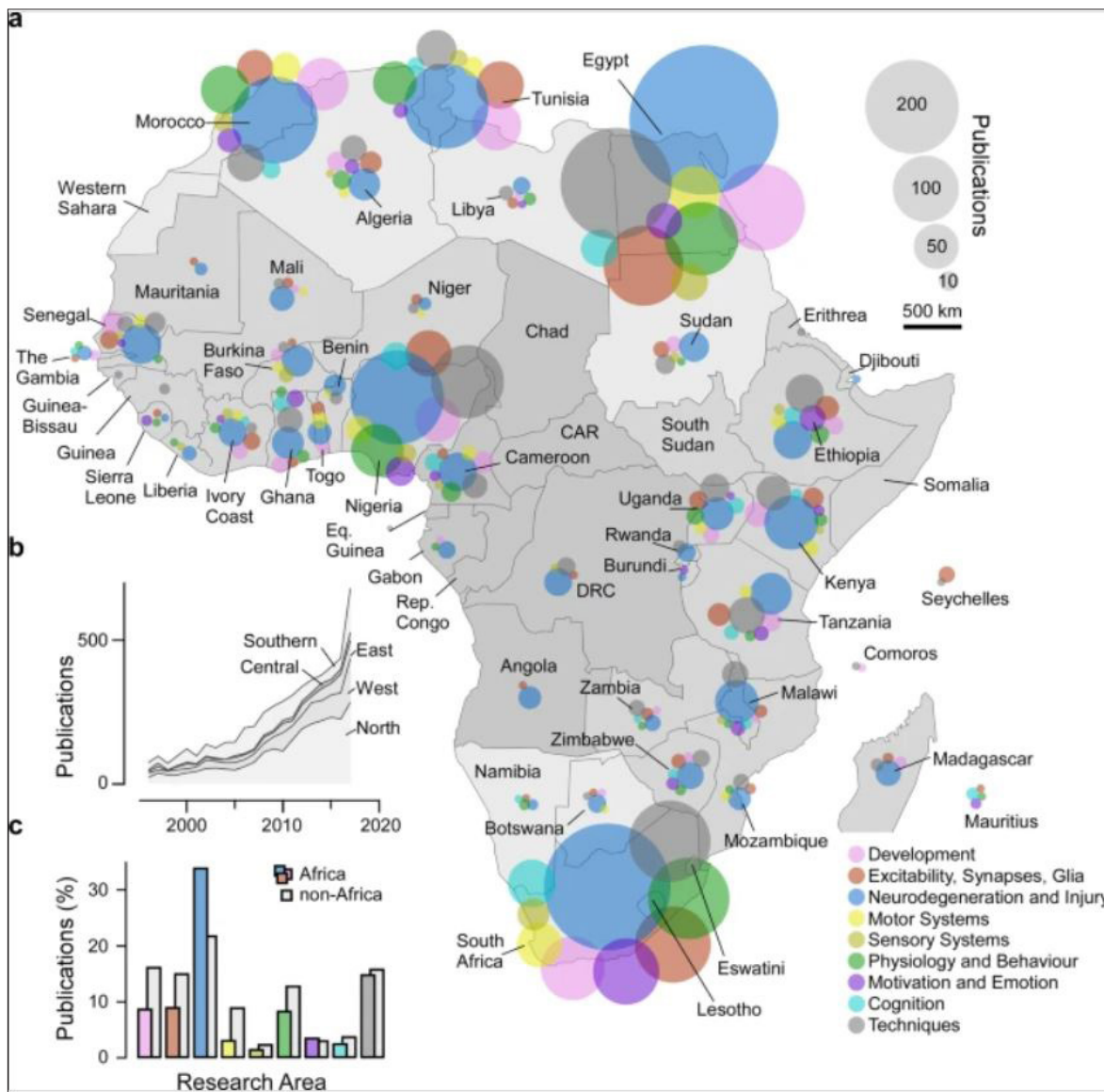


Figure. 1 African neuroscience publications 1996–2017. a: Overview of Africa's neuroscience publications, organised in nine broad topics as indicated by the different colours. Bubble sizes denote the total number of papers per country and topic. b: Total annual publications, with contributions from different African regions highlighted. Regions were delineated following the United Nations definition into North Africa, West Africa, East Africa, Central Africa and Southern Africa. See also background shading in (a). c: Distribution of research topics in Africa (coloured bars, for legend see (a)) and outside of Africa (grey bars). (M. B. Maina et al., 'Two decades of neuroscience publication trends in Africa', *Nat. Commun.*, vol. 12, no. 1, 2021, doi: 10.1038/s41467-021-23784-8.)

health issues.<sup>[42]</sup> Even though there is significant evidence of an increase in the number of neuroscience papers coming from Africa, there is much scope for improvement. There is significant variability in the visibility of neuroscience papers throughout the continent.

Among all the regions in Africa, West Africa appears to be lagging behind the rest of Africa. Nigeria, the nation with the most publications in the area, only produced one neuroscience piece in a journal with an IF of 9.5.<sup>[43]</sup> The lack of visibility, particularly in terms of citations, may

be explained partly by the where work is submitted for publication. Many Nigerian neuroscience publications are published in African journals with limited international recognition.<sup>[43]</sup> Also PubMed database excludes a substantial proportion of African papers.<sup>[44]</sup>

Increased investment in modern research equipment, training in the use of technologies, and the use of genetically tractable models are all necessary to maintain this upward trend and raise the continent's neuroscience prominence.

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# Tobacco smoking: the role of dental health professionals

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## Abstract

Tobacco use is a serious public health problem with smoking as the most common method of consuming tobacco. It is a major preventable cause of premature morbidity and mortality. The prevalence of tobacco smoking varies from country to country. It creates a huge economic burden on the individuals who consume it and on the healthcare system. The current approach toward the management of tobacco smoking addiction revolves around a combination of education, counselling, and pharmacotherapy.

Dental professionals, such as dentists and dental therapists/hygienists have a special role in identifying smokers: odour and teeth stains are obvious revealing signs. Dentists are well placed in tobacco smoking cessation as they provide preventive and curative services on a regular basis. The regularity of visits by patients to dental clinics offer valuable contacts for dental health professionals to initiate and strengthen tobacco cessation measures. Dentists are in a unique position to motivate and assist their patients to quit tobacco use and smoking.

**Keywords:** Smoking, tobacco smoking, dental professionals

## Introduction

Tobacco use is a serious public health problem with smoking as the most common method of consumption. Tobacco smoking is a major preventable cause of premature morbidity and mortality globally.<sup>[1]</sup> It is a health threat to both the smokers themselves and the public arising from secondary exposure. It also poses a huge economic burden and financial implications<sup>[2]</sup> on the individuals who consume tobacco and on the healthcare system. Tobacco forms of usage include cigarette, cigar, pipe, chewed tobacco, dipped tobacco, and snuff (moist and dry), but smoking is the most popular form of usage ahead of chewing tobacco, dipped tobacco, and snuff. Tobacco smoking is a learned behaviour resulting in a physical addiction to nicotine for many smokers.

Tobacco smoking in its various forms (cigars, cigarettes, pipes) is an important risk factor for many non-communicable diseases (NCDs) which include, but are not limited to, cardiovascular disease, lung disease, low birth weight and premature birth.<sup>[3]</sup> It is a cause of many oral diseases and conditions, ranging from mild to life threatening, such as stained teeth, taste disturbance, halitosis, periodontal diseases, poor wound healing, oral mucosal lesions such as hairy tongue, smoker's melanosis (which is a discolouration of the oral mucosa), oral precancerous lesions, and oral cancers.<sup>[4]</sup>

## Prevalence of tobacco smoking

Tobacco smoking often becomes addictive and the prevalence of smoking varies from country to country<sup>[5]</sup> according to the following studies published in 2015 and 2018 from Africa.<sup>[6,7,8]:</sup>

- The prevalence of tobacco smoking was 17.6% in South Africa.<sup>[6]</sup>
- From a systematic review in Nigeria, the prevalence of tobacco smoking was between 0.2% - 32.5%.<sup>[7]</sup>

- A rural population-based study in Tanzania reported a prevalence of current and ex-smokers of 5.4% and 19.8% respectively.<sup>[6]</sup>
- In Madagascar, the prevalence of cigarette smoking among adolescents was 19%.<sup>[6]</sup>
- In Uganda the prevalence of smoking was 34.4% and 7.4% in men and women respectively.<sup>[6]</sup>
- The prevalence of tobacco use in Kenya was 19.1% and 4.5% among adult males and females respectively.<sup>[8]</sup>
- In Angola, the prevalence of current tobacco smoking was reported to be 6.1%.<sup>[6]</sup>

There might be a change in prevalence of tobacco smoking within the last three years in the countries reported.

### Smoking cessation programmes and the role of dental health professionals

The habitual and addictive nature of tobacco smoking makes cessation difficult for chronic smokers. Guidelines suggest that smoking cessation interventions should include both behavioural support and pharmacotherapy<sup>[2]</sup> (e.g., nicotine replacement therapy). The current approach to the management of tobacco smoking addiction revolves around a combination of education, counselling, and pharmacotherapy.<sup>[2]</sup>

The prevention and control of tobacco use are increasing issues of global importance. The links between tobacco use and some oral conditions create an opportunity for dental specialists to become involved in smoking cessation activities. Some dental treatment requires several visits, which provides further opportunities for initiation, fortification, and follow up of tobacco cessation measures.<sup>[9]</sup> These measures are aimed at reducing the effect of tobacco related morbidity and mortality<sup>[7]</sup> by preventing the initiation of tobacco smoking by the non-users and cessation of tobacco smoking<sup>[9]</sup> among current users and chronic smokers.

Dentists are well placed to contribute to tobacco smoking cessation as they provide preventive and curative services on a regular basis.<sup>[3]</sup> Dental professionals can identify the people who use tobacco regularly, document their usage history and offer advice and written materials, as a part of their routine clinical practice.<sup>[10]</sup> They can also adapt their clinical practice so that every patient who uses tobacco is identified and offered at least a session of brief counselling.

By expanding the dental examination, diagnosis, and treatment to include tobacco cessation, a potentially life-saving measure is added to an established service.<sup>[3]</sup> Dentists have a special role in identifying smokers: odour and teeth stains are obvious revealing signs.

The dental clinic is an ideal setting for tobacco cessation

services since preventive or treatment services, oral screening, and patient education have always been a large part of the dental practice. Counselling from a health professional such as a dentist is an effective method of helping patients quit the tobacco habit. The visits of patients to dental clinics or health centres where dental services are offered can create a valuable contact,<sup>[4]</sup> for dental health professionals or allied dental health professional with adequate knowledge and training to initiate anti-smoking activity.

Sometimes, these dentist-patient contacts are under-utilized and there is little interaction between dentist and his patient with regard to prevention of smoking and its consequences.<sup>[11]</sup> It could be attributed to the lack of practice time and resistance on the part of the patients, so some dental professionals avoid this topic.

Enhancing motivation<sup>[12]</sup> is an important part of the overall treatment for tobacco addiction as it increases smokers' enthusiasm, sense of purpose, and will to quit. Dental health professionals should try to advocate for the implementation of the World Health Organization (WHO)<sup>[13]</sup> framework convention in tobacco control in their locality of practice.

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## New global meningitis strategy aims to save 200,000 lives a year



The [first-ever roadmap](#) to defeat bacterial meningitis, aims to reduce deaths by 70 per cent and halve the number of cases by 2030, in addition to reducing disability caused by the disease. The strategy was launched by a broad coalition of partners involved in meningitis prevention at a virtual event, hosted by [WHO](#) in Geneva.

“Meningitis remains a major burden in Africa”, reiterated Dr. Andre Founda, Medical Officer for meningitis at WHO’s Regional Office for Africa, who was also speaking at the launch.

The new Roadmap’s priorities for meningitis response and prevention, include achieving high immunization coverage, the development of new affordable vaccines, and improved prevention strategies and outbreak response. Speedy diagnosis and optimal treatment for patients is also a priority, as well as good data to guide prevention and control efforts, care and support for those affected, and advocacy and engagement, to ensure high awareness of meningitis, accountability for national plans, and affirmation of the right to prevention, care and aftercare services.

See more [here](#).



# How training is encouraging mothers to deliver in health facilities in Ulang, South Sudan

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## Abstract

In South Sudan, health facility delivery coverage is very low despite the presence of health facilities with staff that can conduct deliveries. Some factors like inaccessibility, insecurity, low knowledge of benefits of health facility delivery, poor services, financial challenges, family influence and cultural practices might be some of the reasons that prevent some mothers from delivering in the health facilities.

This paper describes how UNICEF with other partners has started training master trainers with Basic Emergency Obstetrics and New Born Care modules in Greater Upper Nile, and includes a case of one mother who benefited from the training.

**Key words:** Obstetric training, newborn training, delivering in health facilities, Ulang, South Sudan

## Introduction

South Sudan continues to be among the top countries with a high Maternal Mortality Ratio (MMR) and Newborn Mortality Rate (NMR). These were estimated at 800 per 100,000 live births and 39 per 1000 live births respectively according to a study conducted in 2015.<sup>[1]</sup> One reason for these poor rates is that, in South Sudan, health facility delivery coverage is very low even though there are health facilities with skilled health workers who can attend mothers during labour and birth.<sup>[2]</sup>

Despite the tremendous efforts geared toward improving facility delivery, mothers continue to deliver at home for a variety of reasons such as: inaccessibility to health facilities due to distance and insecurity, low knowledge of the benefits of health facility delivery, poor services, financial challenges, family influence, and cultural practices.



Figure 1. Nyakoang Puok Padoch with her newborn baby enjoying skin to skin care within one hour after delivery at Yomding PHCC (photo taken with Nyakoang's permission).

**Citation:** Kier. How training is encouraging mothers to deliver in health facilities in Ulang, South Sudan. *South Sudan Medical Journal* 2021;14(4):135-137 © 2021 The Author (s) License: This is an open access article under [CC BY-NC](https://creativecommons.org/licenses/by-nc/4.0/) DOI: <https://dx.doi.org/10.4314/ssmj.v14i4.7>

### Box 1. The training modules

Provision of Basic Emergency Maternal Obstetric and Newborn Care (BeMONC) is a critical element in improving the health outcomes of pregnant women and newborns. To achieve this; building the capacity of health workers to deliver high quality health services is a key element under the WHO pillars of health systems strengthening.

[Helping Mothers Survive](#) (HMS) and [Helping Babies Survive](#) (HBS) modules build the capacity of all providers to give compassionate, routine and lifesaving care to women and babies; care that honours women's choices. These training modules are designed to be delivered at the job site to the entire team of providers involved in the care of women and their families. These teams include skilled birth attendants such as midwives, doctors and other team members like nurses and support staff. There are a total of 8 modules which are being delivered in phases of two modules per each training.

Up to date, the 4 modules that have been covered in Ulang are:

- [Essential Care during Labor and Birth](#)
- [Essential Care for Every Baby](#)
- [Helping Babies Breathe](#) and
- [Bleeding after Birth Complete](#).

According to the 2010 South Sudan Household and Demographic Survey report, health facility delivery attended by a skilled birth attendant was estimated to be around only 12%.<sup>[3]</sup>

### Training front-line health workers

To support Primary Health Care services in Greater Upper Nile mainly in Jonglei and Upper Nile States, the World Bank, through UNICEF, issued a grant for 20 months (from July 1, 2019 to February 28, 2021) to the health implementing partners operating in these two States. This was to support health services, including maternal and child health services and so decrease maternal and newborn mortality.

Therefore, to improve the knowledge and skills of front-line health workers especially midwives and all those who are directly or indirectly involved in conducting deliveries, UNICEF with other partners like the National Ministry of Health and Johns Hopkins Program for International Education in Gynaecology and Obstetrics (JHPIEGO) started training master trainers with Basic Emergency Obstetrics and New Born Care modules (See Box 1 for details).<sup>[4,5,6,7]</sup> This training used a Low Dose High Frequency approach by which the training could be cascaded from master trainers down to the health facility staff at various groups across Jonglei and Upper Nile States.

Due to the knowledge and skills gained through this training, it is thought that a number of delivery-related potentially fatal complications were successfully managed by the trainers and the staff they have trained. Also, more women are being encouraged to deliver in a health facility as the story below illustrates.

### The story of Madam Nyakoang Puok Padoch

I, Panom Puok Duoth Kier, am among the master trainers who have benefited from this training. Here I share my experience when I interacted with one mother who came for delivery at Yomding PHCC when I was there to conduct the Helping Babies Breath (HBB) module training.

This story illustrates that some women do want to deliver in health facilities in spite of challenges such as difficult journeys, and that, if they get good care, they can be advocates to others to do the same - just as Nyakoang Puok Padoch has done.

It was just around 9 am on June 17, 2021 when Nyakoang Puok Padoch was rushed to Yomding PHCC while in labour pain.

Nyakoang Puok Padoch, aged 28 years, Gravida 5, Para 4, had attended the antenatal clinic (ANC) at Yomding PHCC three times during this pregnancy. She had been attending ANC during all her previous pregnancies.

Nyakoang lives in the village of Tuaregany across the river from Yomding, a distance of approximately five kilometers; there is no health facility in the village so villagers have to come to Yomding for health services.

According to Nyakoang her labour pains started at 5pm on June 16 when she was working on her farm but she was unable to reach Yomding until the next day as there was no canoe that could take her across the river. She had to wait all night in labour until she could reach the Yomding PHCC the next morning. There, at exactly at 9:39 am, Nyakoang delivered, with care from myself and the midwives I was training, a healthy baby boy who was



Figure 2. Panom Puok Duoth (Health Manager for SSAID/County Health Coordinator for Lot 5) interviewing Madam Nyakoang Puok Padoch and her caretaker on the importance of health facility delivery at Yomding PHCC (Photo taken with Nyakoang's permission).

crying, breathing well and responding to touch within the first minute after birth. All the necessary care, including skin-to-skin care (Figure 1) was provided to Nyakoang and the newborn as soon as the baby was delivered. Later I interviewed her about the care she had received and what she felt about delivering in a health facility (Figure 2).

Nyakoang, said, "Delivery in a health facility is very important; when I came here, I was suffering but after I delivered, I felt well", and, "I am very happy with the midwives (Thichiot Lim, Gnajuok Panom and Mama Nyaleek Tong) at Yomding PHCC who have assisted me when I was delivering."

Nyakoang's message to other mothers is, "I tell every mother to come and deliver in the health facility. It is the safest place to have your baby and they will help you if you have complications."

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6. Helping Babies Survive. Helping Babies Breathe <https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/helping-babies-survive/Pages/Helping-Babies-Breathe.aspx>
7. Helping Mothers Survive. Bleeding after Birth Complete <https://hms.jhpiego.org/bleeding-after-birth-complete/>

## Gordon Memorial College Trust Fund (GMCTF) Awards for 2022/2023 academic year

Applications for awards of the GMCTF will open at the beginning of December 2021 and close on 28/02/2022. Applicants who have admissions to a postgraduate course in a recognised University may apply through the GMCTF website [www.GMCTF.org](http://www.GMCTF.org).

Those already in receipt of an award may re-apply for extension on production of evidence of satisfactory progress from Dean of his/her faculty or course supervisor. All applications must be accompanied by two references, one of which must be from a person in the applicant's area of study.

**Dr. Eluzai Hakim,**

International Adviser to the Royal College of Physicians London on South Sudan and Associate Editor SSMJ.

# Possible acetaminophen poisoning complicated by puerperal sepsis

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## Abstract

Acetaminophen (paracetamol) toxicity is an important cause of morbidity and mortality worldwide. It is estimated that poisoning contributes to more than 1 million poisonings and up to half a million deaths each year, yet it is preventable and treatable.

Acetaminophen toxicity is the second most common cause of liver transplantation worldwide.

However, studies concerning poisoning in Botswana are scant, although it has been reported that poisoning contributes 6.7% of the total injuries and is ranked third next to falls and automobile accidents among external causes of mortality.

This case report reviews the aetiology, evaluation, and treatment of acetaminophen overdose.

**Key words:** Acetaminophen / Paracetamol toxicity, acetaminophen overdose, acute liver failure, N-acetylcysteine, liver hepatotoxicity, hepatic encephalopathy, liver transplant.

## Introduction

Acetaminophen (paracetamol) toxicity is a common medical emergency with serious morbidity and mortality worldwide.<sup>[1]</sup>

In Botswana, the highest number of cases of poisoning are caused by acetaminophen if taken in excess of 10-15gms.<sup>[2]</sup>

Single or repeated doses totalling 10-15g or 150 mg/kg of acetaminophen taken within 24 hours may cause severe hepatotoxicity and, less frequently, acute kidney injury (AKI).

The objectives of this paper are to

- Review the pathophysiology of acetaminophen toxicity.
- Describe the four clinical stages of acetaminophen toxicity.
- Identify the treatment strategies for an alert patient who presents within an hour of overdose versus a patient who presents after two hours.

## Case Report

We describe a 25-year-old female referred to our hospital's intensive care unit (ICU) with suspected acetaminophen toxicity.

The patient had acute liver failure (ALF), acute kidney injury (AKI) with oliguria, incomplete abortion, underlying hydrocephalus managed with ventriculo-peritoneal shunt (VP shunt), blindness and depression.

The patient swallowed an unknown number of acetaminophen tablets a day before presentation as reported by the mother who additionally said the patient had episodes of headache. Acetaminophen, as an over counter medication, had

**Citation:** Kual, Possible acetaminophen poisoning complicated by puerperal sepsis. *South Sudan Medical Journal* 2021;14(4):138-141 © 2021 The Author (s) **License:** This is an open access article under [CC BY-NC](https://creativecommons.org/licenses/by-nc/4.0/) DOI: <https://dx.doi.org/10.4314/ssmj.v14i4.8>

**Table 1. Glasgow Coma Scale (GCS)****Eye Opening Response**

- Spontaneous--open with blinking at baseline 4 points
- To verbal stimuli, command, speech 3 points
- To pain only (not applied to face) 2 points
- No response 1 point

**Verbal Response**

- Oriented 5 points
- Confused conversation, but able to answer questions 4 points
- Inappropriate words 3 points
- Incomprehensible speech 2 points
- No response 1 point

**Motor Response**

- Obeys commands for movement 6 points
- Purposeful movement to painful stimulus 5 points
- Withdraws in response to pain 4 points
- Flexion in response to pain (decorticate posturing) 3 points
- Extension response in response to pain (decerebrate posturing) 2 points
- No response 1 point

been bought by a relative. The mother did not know how many tablets had been obtained and ingested. The tablet bottle was not brought to the hospital. The patient had been initially managed at the referring hospital for two days before transfer to our ICU.

The patient had severe hepatic dysfunction with elevated liver enzymes and altered sensorium consistent with hepatic encephalopathy. Serum aspartate aminotransferase (AST/SGOT) was initially 300 U/L (normal range: 10 – 34) while serum alanine transferase (ALT/SGPT) was not measured in the referring hospital. The patient had right upper quadrant tenderness on deep palpation with flapping tremors but there was no jaundice. She rapidly developed tachypnoea and respiratory distress with foaming from the mouth.

Upon arrival to our ICU, the patient's Glasgow Coma Scale (GCS) fell to 6/15, respiratory rate of 54 b/m, heart rate of 140 bpm, blood pressure fluctuating between 110-130/40-60 mmHg and saturation of 90% on high flow oxygen. The GCS is the most common scoring system used to describe the level of consciousness in a person -Table 1. A urinary catheter drained 100 ml of concentrated urine.

A person's GCS score (Table 1) can range from 3 (completely unresponsive) to 15 (responsive). This score is used to guide immediate medical care.

In view of the respiratory distress and falling GCS, the patient was intubated and mechanically ventilated.

The blood pressure dropped to 80/40 mmHg which did not respond to IV fluid therapy (2 litres of normal saline 0.9%). Adrenaline infusion was started followed by dopamine infusion, and N-acetylcysteine (NAC) administered after central venous cannulation of the right subclavian vein. The plasma level of acetaminophen could not be measured in our facility.

N-acetylcysteine (NAC) is an amino acid produced from L-cysteine that is used as a dietary supplement. It is utilized as an acetaminophen overdose antidote. It is thought to reduce DNA damage as an antioxidant. NAC is also used to support healthy immunological function and has liver-protective effects.

Tables 2 and 3 show the values for the routine laboratory tests done.

The elevated serum creatinine suggested acute kidney injury and the high liver transaminases suggest severe liver damage. The patient also showed electrolytes imbalance of hyperchloraemia indicating the inability of her kidneys to regulate electrolytes due to dehydration and probably severe acute kidney injury. Prothrombin time done at the referring hospital revealed an elevated level of 26.3 sec. The INR (2.61) was raised above normal reference range. The patient was given clexane 40 mg subcutaneously daily as prophylaxis against deep venous thrombosis (DVT).

She remained critically ill, oliguric, tachycardic, hypotensive on high dose of vasopressor.

Ultrasonography of the abdomen, revealed increased endometrial thickness and retained products of conception. A pelvic examination showed foul smelling discharge.

The patient presented with fever 39.4° C and hypotension 82/40 mm Hg, HR of 125 bpm, generalized malaise, and altered mentation suggesting sepsis. On arrival she was somnolent. She had a respiratory rate of 40 per minute, and a pulse oximetry of 92% on mechanical ventilation. Physical examination showed dry mucous membranes, tachycardia and regular rhythm, tachypnoea and normal pulmonary breath sounds. She was initially in pain as reported by the mother prior to her consumption of the unspecified number of acetaminophen tablets. We considered that acetaminophen poisoning might have been the leading primary insult, with sepsis complicating the picture.

Her urine and serum human chorionic gonadotrophin (HCG) were positive suggestive of a missed/incomplete abortion. Antibiotics (IV ceftriaxone 1 g daily and IV infusion of metronidazole 500 mg three times daily) were prescribed with NAC. The gynaecologist was consulted who agreed with the likelihood of missed abortion.

The patient's condition deteriorated with falling blood

pressure to 70/35 mmHg and oxygen desaturation < 90%. She was given one litre boluses of normal saline 0.9%, adrenaline 6 mcg/min (90 ml/hr) and dopamine infusions 50 mcg/kg/min but unfortunately, she died on day 3 after admission to the ICU. The relatives refused consent for post-mortem examination.

**Discussion**

**Review of pathophysiology**

Within 24 hours following an acetaminophen overdose, anorexia, nausea, and vomiting appear.<sup>[3]</sup> Hepatotoxicity may not show up in clinical tests for 4 to 6 days after ingestion. when acetaminophen levels are no longer detectable Necrosis around the central vein is a common lesion.

The liver enlarges and becomes tender. The liver transaminases (AST and ALT) rise for up to two weeks before returning to normal. Transaminase levels above 1,000 IU/L reflect severe liver damage.<sup>[4]</sup>

The bilirubin levels are typically only moderately elevated. Hepatic clotting factor synthesis is reduced, and prothrombin time is prolonged. It has been recorded that disseminated intravascular coagulation (DIC) occurs in the presence of hepatic necrosis.<sup>[5]</sup>

Acute kidney injury (AKI) caused by acetaminophen poisoning may occur alone or in combination with hepatic necrosis. Urine production varies between patients. Acute tubular necrosis (ATN) can be distinguished from hepatorenal syndrome (HRS) and prerenal azotaemia based on urinary findings.

Urinary granular casts with or without haematuria or pyuria are common in ATN. Urine osmolality is usually similar to plasma osmolality, but urine sodium concentration is usually greater than 20 mmol/L. Urinary particles such as tubular epithelial cell casts and/or granular casts in the urine sediment are common, urinary sodium is low (less than 10 mmol/L), and osmolality is far higher than plasma osmolality in HRS and prerenal azotaemia.

As seen in our case, renal dysfunction also occurs alongside hepatic encephalopathy in serious overdoses, and may necessitate dialysis.

**Stages of acetaminophen toxicity**

The clinical course of acetaminophen toxicity is divided into four stages.

- During the first stage (30 min to 24 hours), the patient may be asymptomatic or may have emesis.
- In the second stage (18 hours to 72 hours), there may be emesis plus right upper quadrant pain and hypotension.
- In the third stage (72 hours to 96 hours),

**Table 2. Complete Blood Count**

Test	Laboratory result	Reference range
WBC	9.42 X 10 <sup>9</sup> /L	4000 – 11000
RBC	3.37 X 10 <sup>12</sup> /L	3.5 – 5.4
Hb	14.7 g/dL	11.5 – 16.5
PCV/ HCT	46.3 %	33 – 48
MCV	86.2 fL	83 – 99
MCH	27.4 pg	27 -31
Platelets	149 X 10 <sup>9</sup> /L	150 – 400
Neutrophils	7.27 X10 <sup>9</sup> /L	2.0 – 7.5
Lymphocytes	1.71 X10 <sup>9</sup> /L	1.0 – 4.0
Monocytes	0.43 X10 <sup>9</sup> /L	0.1 – 0.8
Eosinophils	0.00 X10 <sup>9</sup> /L	0.0 – 0.4
Basophils	0.01 X10 <sup>9</sup> /L	0.0 – 0.2

**Table 3. Serum Urea, Electrolytes, Creatinine and Liver Transaminases**

Test (Serum)	Laboratory result	Reference range
Urea	8.48 mmol	2.0 – 7.0
Creatinine	283.3 umol/L	44 – 106
Sodium	150.3 mmol/L	135 - 145
Potassium	3.12 mmol/L	3.5 – 5.1
Chloride	116.4 mmol/L	95 - 108
Total bilirubin	164.2 umol/L	0.1 – 21.0
Aspartate transferase (AST)	1285 U/L	10 -34
Alanine transferase (ALT)	1100 U/L	11 - 41
Total protein	50.8 g/L	60 - 80
Albumen	21.7 g/L	15 - 55
Eosinophils	0.00 X10 <sup>9</sup> /L	0.0 – 0.4
Basophils	0.01 X10 <sup>9</sup> /L	0.0 – 0.2

liver dysfunction is significant with renal failure, coagulopathies, metabolic acidosis, and encephalopathy. Gastrointestinal (GI) symptoms reappear, and death is most common at this stage.

- The fourth stage (4 days to 3 weeks) is marked by recovery.

**Treatment of acetaminophen toxicity**

An IV acetaminophen overdose is evaluated and treated similarly to an oral acetaminophen overdose. After ingestion, most emergency departments begin with gastrointestinal (GI) decontamination agents. If the patient is awake and presents within one hour of ingestion, oral activated charcoal is given. Acetaminophen is easily absorbed by activated charcoal.

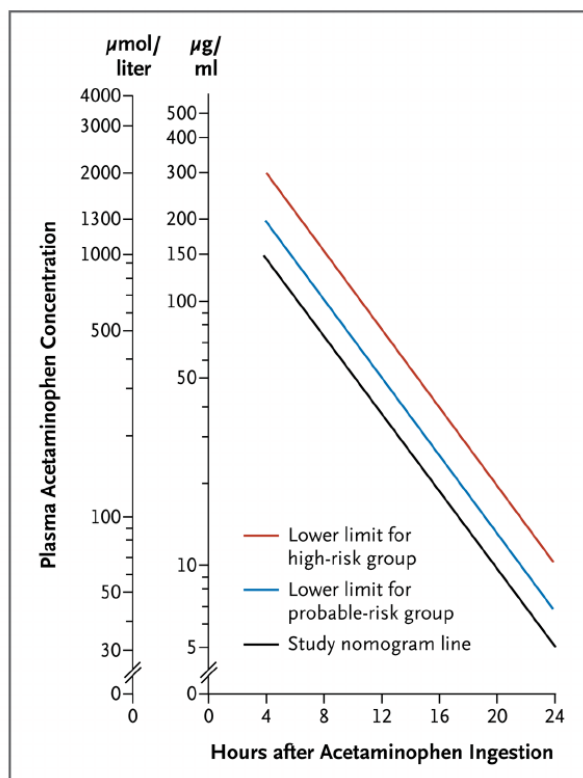


Figure 1. Rumack-Matthew Nomogram published with permission *New England Journal of Medicine* 359(3):285-92 DOI:10.1056/NEJMct0708278 July 2008 PubMed

If given within one hour of ingestion, or later if the ingestion contains an agent that delays gastric emptying or slows GI motility such as levodopa and nicotine, the activated charcoal may provide a major treatment advantage. After being medically approved, patients with acetaminophen concentrations below the “possible” line for hepatotoxicity on the Rumack-Matthew nomogram may be discharged.

The Rumack-Matthew nomogram (also known as the acetaminophen-toxicity nomogram, see Figure 1) plots serum acetaminophen concentration against time after ingestion to predict potential liver toxicity and to help the clinician decide whether or not to treat with NAC. It’s a logarithmic graph that starts 4 hours after ingestion, after absorption is thought to be possible.<sup>[6]</sup>

This nomogram enables the treatment of acetaminophen overdose in a timely manner. A plasma and liver acetaminophen-protein (APAP) adduct levels of 140-150 mcg/mL at 4 hours after ingestion usually indicates that NAC treatment is needed. When given within 8 hours of an acute acetaminophen ingestion, NAC is nearly 100 percent hepatoprotective. NAC is safe to take orally and intravenously.

The following is the FDA-approved NAC (Mucomyst) oral administration regimen: To make a 5% solution, dilute the 20% solution 1:3 with cola, orange juice, or

another soft drink. For a total treatment of 72 hours, use within 1 hour of preparation.

NAC (Acetadote) IV: The IV version of NAC (Acetadote) is also used in many emergency rooms to treat acetaminophen ingestion. If the patient is unable to tolerate oral NAC due to emesis that is resistant to antiemetics, the IV formulation of NAC is favoured.<sup>[7]</sup>

For the loading dose, dilute 150 mg/kg (maximum 15 g) in 200 mL of 5% dextrose in water (D5W) and infuse for 60 minutes. Dilute 50 mg/kg (maximum 5 g) in D5W 500 mL for the second dose and infuse for 4 hours. Dilute 100 mg/kg (maximum 10 g) in D5W 1,000 mL for the third dose and infuse for 16 hours to prevent fluid overload in patients weighing less than 40 kg and those who need dialysis.

Liver transplantation is the final resort in cases of serious hepatotoxicity that has progressed to liver failure.

### Conclusion

Acetaminophen toxicity is a most common medical emergency that leads to morbidity and mortality around the world.

Following an acute overdose, severe toxicity may be mitigated or avoided with early diagnosis and prompt administration of NAC. Late presentation may lead to severe liver damage.

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# Who reads the SSMJ? Summary report on the readership of the journal 2008–2021

SSMJ Editorial Team

## Introduction

In February 2008 Dr Eluzai Abe Hakim launched the Southern Sudan Medical Bulletin which has evolved into the quarterly 24-page free online journal, the South Sudan Medical Journal (SSMJ), the only medical journal in South Sudan. The Editor-in-Chief is Dr Edward Eremugo Kenyi. There are three Trustees who oversee our limited funds.

To date (August 2021) we have published 55 issues each containing around 5-8 main peer reviewed articles and several short items. SSMJ is a member of African Journal Online (AJOL), is listed by the Directory of Open Access Journals (DOAJ) and has a Facebook group. We are presently updating our website, and investigating other ways to improve the journal.

We hope that this article, which shows an increasing number of visits to the journal, will encourage readers to continue submitting their research and other manuscripts, and to tell us how we can improve the content, and outreach of the journal, especially within South Sudan and Africa. Send your feedback to [southsudanmedicaljournal@gmail.com](mailto:southsudanmedicaljournal@gmail.com).

## SSMJ readership: who? what? where?

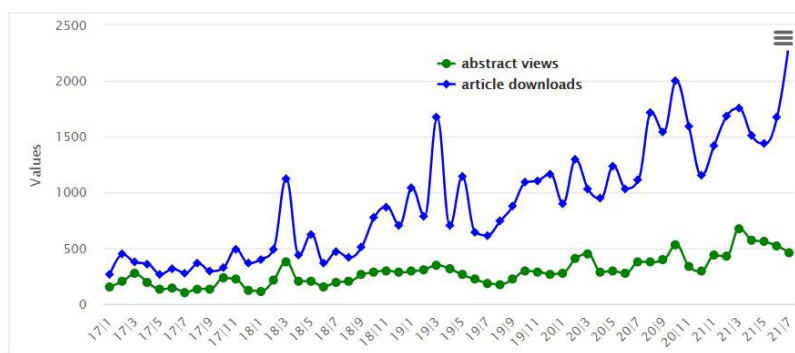
We have examined data from AJOL, Google Analytics and our mailchimp mailing list. The journal is also distributed through the networks of the SSMJ team and colleagues.

## Data from AJOL

The [AJOL](#) website shows the number of views of abstracts and downloads of articles over time and by country for each issue of SSMJ (click on the month of interest).

As of July 2021 (the latest date with complete data), the site carried 354 titles (articles) in 56 issues (since we joined AJOL in 2017). AJOL does not upload all SSMJ items and does not show the number of views for specific articles. Downloads of articles have increased from 269 in January 2017 to 2373 in July 2021. See Summary Figure AJOL 1.

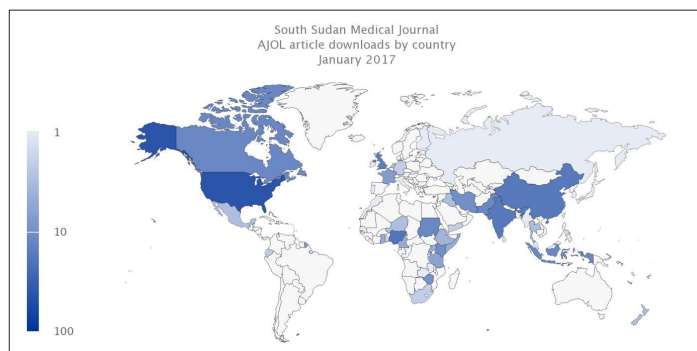
The maps in Summary Figures 2a and 2b show that the countries with the greatest the number of downloads has changed (and increased) between 2017 and 2021.



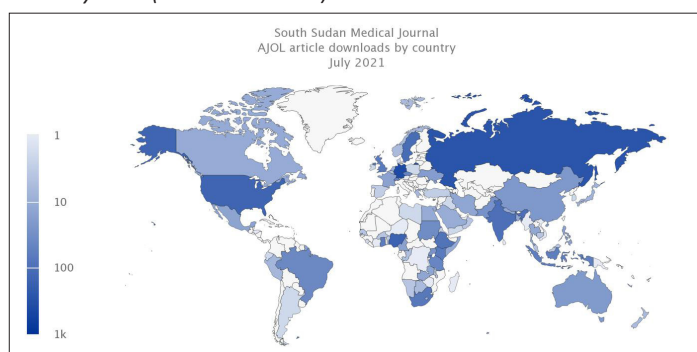
Summary Figure AJOL 1. Views and downloads from each issue from February 2017 to July 2021

**Citation:** SSMJ Editorial Team. Who reads the SSMJ? Summary report on the readership of the South Sudan Medical Journal 2008 – 2021 – Summary. South Sudan Medical Journal 2021;14(4):142-145 © 2021 © 2021 The Author (s)  
**License:** This is an open access article under [CC BY-NC](#) DOI: <https://dx.doi.org/10.4314/ssmj.v14i4.9>





Summary Figure AJOL 2a. Number of articles downloaded by country in February 2017 (note: scale 1-100)



Summary Figure AJOL 2b. Number of articles downloaded by country in July 2021 (note: scale 1-1K)

	Germany	410		China	22
	Russian Federation	281		Australia	20
	Nigeria	163		Ukraine	18
	United States	147		Rwanda	16
	Sweden	111		Cameroon	15
	India	100		France	15
	Ethiopia	84		Philippines	15
	South Africa	72		Mexico	14
	Kenya	68		Iran, Islamic Rep.	13
	United Kingdom	66		Zambia	13
	Ghana	62		Bangladesh	12
	Indonesia	58		Nepal	12
	Switzerland	53		Thailand	12
	Czech Republic	45		Canada	11
	Tanzania	44		Egypt, Arab Rep.	11
	Brazil	39		Somalia	11
	Sudan	34		Netherlands	10
	Pakistan	27		Saudi Arabia	10
	Uganda	26			

Summary Figure AJOL 3. Number of downloaded articles in July 2021 by countries from which there were at least 10 article downloads

Summary Table A. Page views of most popular articles in June 2020 and May 2021

[Issue] Page Title	202006	202105	Total over 12 months
[May 2010] How to read an Electrocardiogram (ECG). Part One: Basic principles of the ECG. The normal ECG	21386	39336	<b>346357</b>
[May 2008] How to Read a Chest X-ray – A Step by Step Approach	5322	13721	<b>99292</b>
[Nov 2011] How to treat kerosene poisoning	5658	3866	<b>58415</b>
[May 2016] Factors contributing to, and effects of, teenage pregnancy in Juba	1250	4608	<b>38051</b>
[Feb 2013] Tuberculosis 2: Pathophysiology and microbiology of pulmonary tuberculosis	2268	3674	<b>31907</b>
[Nov 2008] Tapes for measuring Mid Upper Arm Circumference	1042	1531	<b>17715</b>
[Aug 2016] How to interpret an unenhanced CT Brain scan. Part 1: Basic principles of Computed Tomography and relevant neuroanatomy	1196	1538	<b>16174</b>
[Nov 2010] How to read an electrocardiogram (ECG). Part 2: Abnormalities of Electrical Conduction	953	1361	<b>13990</b>
[May 2008] Undernutrition in Adults and Children: causes, consequences and what we can do	719	2518	<b>13557</b>
[May 2017] How to interpret liver function tests	649	2546	<b>12375</b>
[Nov 2016] How to perform a Lumbar Puncture	822	835	<b>9449</b>
[May 2009] Feeding infants whose mothers are HIV-positive	709	722	<b>8564</b>
[Nov 2015] The importance of research in healthcare	470	436	<b>5802</b>
[May 2016] Open Appendectomy....How I do it	305	504	<b>5518</b>
Other	10077	13033	<b>133842</b>
<b>Total</b>	<b>54245</b>	<b>92223</b>	<b>829985</b>

## SUMMARY

**Summary Table B.1 Total visitors to articles between June 2020 – May 2021 – top 15 countries**

Country	Total
South Sudan	4608
India	199594
United States	102256
Philippines	40456
United Kingdom	30888
South Africa	19661
Kenya	19436
Pakistan	19264
Nigeria	16610
Malaysia	10494
Australia	10372
Canada	9763
Ghana	7518
Zambia	7092
Saudi Arabia	6795
Bangladesh	6749

**Summary Table B.2. Total visitors from East/Central Africa to articles between June 2020 – May 2021**

Country	Total
Burundi	40
Central African Republic	50
Congo - Kinshasa	115
Djibouti	24
Eritrea	9
Ethiopia	3289
Kenya	19436
Rwanda	593
Somalia	1013
<b>South Sudan</b>	<b>4608</b>
Sudan	2540
Tanzania	6070
Uganda	5209
Zambia	7092
Saudi Arabia	6795
Bangladesh	6749

Summary Figure AJOL 3 shows the number of downloaded articles in July 2021 by countries from which there were at least 10 article downloads; note that there were no downloads in South Sudan although 46 Abstracts were viewed.

### **Data from Google Analytics** (analysed by James Beard)

Data showing the number of pages (or titles/articles) viewed were available from 2010. See the [full report](#) for detailed individual tables.

Summary Table A lists the top most popular titles, (published between 2008 – 2017), the number of times they were viewed in June 2020 and May 2021, and the total views for each over the 12-month period between June 2020 and May 2021.

Papers with 'How to' in the title were consistently most popular. Of the 14 titles 8 were entitled 'How to...'; three were related to malnutrition.

The top title, 'How to read an ECG', had consistently the most views over the 12-month period with a total of 346K views (which is ~43% of the total visits of all titles of ~830K). However, this seems to be an 'outlier' as the second most popular title had 99K views, and views to the other 'top-14' titles ranged from totals of 58K to 6K.

The number of visits to each paper went up over the year; there was a total of 54K views in June 2020 and 92K in May 2021.

When 'top' titles were examined by number of viewers

in East Africa there was a similar picture with 'How to...' articles being popular. See Table C in the [full report](#).

Summary Tables B.1 and B.2 list total visits to titles by countries from 1 June 2020 to 31 May 2021. The 15 countries with the most frequent visits are shown in Summary Table B.1.

Again, the trend in most countries (see [full report](#)) was for visits to increase over the year. The total visits from all countries were 40K in June 2020 and 70K in May 2021.

Among African countries the five with the highest number of total visits over the year were: South Africa 20K, Nigeria 17K, Kenya 19K, Ghana 8K and Zambia 7K; South Sudan was 4.6K. For countries neighbouring South Sudan (Summary Table B.2) those with the most visits (i.e.,  $\geq 1K$ ) were: Ethiopia, Kenya, Somalia, Sudan, Tanzania and Uganda.

### **Data from the Mailchimp mailing list**

Our mailing list was started in 2010. In August 2020 it contained >400 email addresses but the number of 'clicks' had decreased from a high of 50% in 2010 to around 15% in 2020. This is probably due to many email addresses changing, and thus this analysis gave no useful data.

### **Conclusion**

These data give a clear indication of:

- The increasing access to the journal and

- the type of papers read which in turn
- helps us the focus on what readers find valuable.
- The spread of countries across the world from where readers access SSMJ.
- What can be done with minimal resources (apart from our collective voluntary hard work) and
- this indicates that sustainability of such a journal can be maintained by international co-operation and commitment.

In addition:

- Mailchimp is of limited direct use but the mailer is being forwarded on by recipients to colleagues.
- Comments received by some of the team indicate that presentation/format has improved.
- Access and thus number of visits should increase when the new website allows better access via cellphone/mobile.
- Shows value of being accepted and listed by AJOL.

#### Follow-up

Although the readership data are encouraging, we have several challenges to keep the journal sustainable and improving. For example:

- The need for more people to find authors/topics for articles, and to collect 'news' relevant to health professionals working in South Sudan.

- Need to encourage more Board members to motivate their students/colleagues to submit their manuscripts.
- About 5-6 people are doing most of the editorial work. So we need more people to copyedit – for authors unused to publishing we can spend a lot of time (and emails) sorting their articles.
- Need backstops for key people such as the Editor-in-Chief, especially to deal with IT issues.
- Need to 'advertise' the journal more widely through networks and social media. Do we need more publicity within and outside South Sudan? Why are there so many readers in Kenya compared to other neighbouring countries?
- How do we reach out to more nurses/midwives, and other health professionals, including medical students?

#### Types of articles and content

- Although 'How to...' articles are popular they are not the only well-read ones and for the journal to increase its prestige we must publish more good research relevant to South Sudan.
- When resources (especially human) allow we should develop our 'e-learning zone'.

## Mass distribution of long-lasting insecticidal nets during COVID-19: lessons from South Sudan

- Mass distribution campaigns can be delivered effectively during pandemics with the support of strong guidelines.
- In South Sudan, social and behaviour change (SBC) activities are successful in disrupting entrenched health behaviours, which hinder the adoption of transmission prevention guidelines.
- Community engagement and training are essential to the successful delivery of long-lasting insecticidal nets (LLINs) in pandemic contexts.

See more [here](#).

# Use of antigen rapid diagnostic tests to gauge the level of COVID-19 infections in South Sudan

**Dr John Rumunu,  
Director General Preventive Health Services, and Acting COVID-19 Incident  
Manager, Ministry of Health, Republic of South Sudan**

South Sudan confirmed the first case of COVID-19 on 5 April 2020. Since then, the country has experienced two waves. By the 42<sup>nd</sup> epidemiological week only 247,059 samples were tested and 12,293 cases confirmed with a positivity of 5%. South Sudan is still on alert despite a decrease in confirmed cases for six consecutive weeks as of 28 October 2021.<sup>[1]</sup>

To gauge the level of COVID-19 infections in the country the National Task Force (NTF) on COVID-19 issued a directive to “carry mass testing to both public and private institutions through rapid diagnostic tests.”<sup>[2]</sup> This directive was driven by the recognition that there is currently inadequate COVID-19 testing in the country, with most (>80%) of the samples tested coming from Juba (mostly from pre-travel screening at eight private laboratories).<sup>[3]</sup>

Recognizing the need to optimize testing in South Sudan, the Ministry of Health (MOH) issued guidelines in March 2021 for use of antigen rapid diagnostic tests (Ag-RDTs) as an alternative to the nucleic acid amplification test (NAAT). These guidelines were approved by the Medical Advisory Panel (MAP) and referenced in the “Updated MAP-COVID-19 Travel Guidelines March 2021.” Additionally, the MOH developed an implementation plan for the rollout of Ag-RDTs including the procurement of 10,000 Ag-RDT kits, training of 380 healthcare workers across 112 health facilities, and incentives for state trainers and healthcare workers in the facilities.

As of 15 December 2020, three Ag-RDTs have received World Health Organization (WHO) Emergency Use Listing (EUL) approval for detection of SARS-CoV-2 viral antigens:

1. Standard Q COVID-19 Ag test from SD Biosensor Inc.
2. Abbott-Panbio COVID-19 Ag test for nasopharyngeal swab specimens.
3. Abbott-Panbio COVID-19 Ag test for nasal swab specimens.

Available WHO reports on the three Ag-RDTs show that they meet the minimal performance requirements compared to the NAAT gold standard.

To implement the NTF guidance on the use of Ag-RDT for COVID-19 testing, the Epidemiological Surveillance Technical Working Group recommends the following:<sup>[4]</sup>

1. Response to suspected outbreaks of COVID-19 in remote settings, institutions, or congregate communities where access to PCR testing is not immediately available.
2. Outbreak investigations by rapid response teams in closed settings like schools, prisons, workplaces, etc.
3. Monitor trends in incidence among health workers and other essential workers in counties with widespread transmission.
4. Testing asymptomatic and symptomatic contacts of confirmed cases. Contacts of PCR-confirmed cases with negative Ag-RDT result should be quarantined until confirmed negative with a PCR test.
5. In counties with widespread community transmission, Ag-RDTs can be used for early detection of symptomatic cases and isolation of positive cases in health facilities, prisons, schools, and screening of front-line health workers.
6. Mass testing using Ag-RDT in non-congregate settings such as government ministries, private companies, offices of non-government organizations, or other workplaces undertaken to investigate a suspect outbreak or to rapidly identify cases in an institution located in a county experiencing widespread community transmission.
7. For case finding (i.e., suspected cases, symptomatic patients/or travellers, and contacts of confirmed cases).

# A Health and Social Sciences Research Institute established in South Sudan



Members of HSSRI-SS (credit Brian Madison)

On 15th April 2021, a group of South Sudanese clinicians and academics met in Juba South Sudan. They identified the need for organized Research in South Sudan and agreed to form a Health and Social Sciences Research Institute of South Sudan (HSSRI-SS).

This body was registered in Juba on 23rd Aug 2021 as a professional, not-for-profit, non-sectarian and non-political body to promote research in Health and the Social Sciences.

Its main aims are to:

1. Build research capacity in South Sudan,
2. Embed research in clinical practice, university departments and other higher institutions of learning,
3. Harness the talents of young and enthusiastic South Sudanese in the field of Research,
4. Conduct baseline research at community and hospital (facility) level with the aim of identifying cost effective modes of managing and preventing common conditions in the country,
5. Disseminate relevant research findings in Health and Social Sciences to enable the implementation of evidence-based findings in health service delivery and social care strategies,
6. Provide an outlet for South Sudanese professionals to showcase their research findings in international fora including publications in established global journals,
7. Forge collaboration with similar organizations/institutes in the region, other parts of Africa and the rest of the World,
8. Raise funding for research activities to sustain the Institute.

The Institute pledges to undertake multi-Centre international studies involving drug trials and the treatment of common globally challenging conditions such as malaria, HIV/AIDS, COVID-19 and the neglected tropical conditions to generate adequate and reliable data to inform treatment and prevention guidelines/protocols, policies, strategies and decisions at various levels of governance.

The interim Executive Committee of the Institute consist of the following:

Chairman: Dr. Justin Bruno Tongun

Secretary: Dr. Brian Billy Berto Madison

Treasurer: Dr. Gasim Omer El Khalifa Abd-Elfarag and Mrs. Clara Stephen Guya Lumori

The current membership stands at 15 individuals of both genders.

Any organization or individuals who wish to collaborate with the HSSRI-SS may contact the Chairman on email [ihealthandsocialsciences.ssd@gmail.com](mailto:ihealthandsocialsciences.ssd@gmail.com).

The website of the Institute in currently under development.

# Launch of the South Sudan Orthopaedics and Trauma Society

**Dr Brian B. B. Madison, MBBS, MMED, DTM&H  
Clinical Fellowship, Orthopaedic Trauma (McMaster University)  
President, South Sudan Orthopaedics and Trauma Society**

The South Sudan Orthopaedics and Trauma Society (SOTS) was officially launched on the 28th of August 2021. See Figure 1. The event brought together many stakeholders involved in the field of orthopaedics and trauma. In attendance were the Undersecretary in the Ministry of Health, representatives from professional medical associations, NGOs active in orthopaedics and trauma, and health insurance and pharmaceutical companies. The meeting was honoured by the presence of His Grace Santo Loku Pio, the Auxiliary Bishop of the Archdiocese of Juba. He assumed the role of the Patron of the Society.

The Society constitutes a group of ten Orthopaedic Surgeons, some with subspecialty training in arthroplasty, limb reconstruction and deformity correction, pelvis and acetabulum trauma surgery, and spine surgery. The membership also includes orthopaedic trainees and general practitioners with an interest to specialize in orthopaedics.

“Our vision of establishing and maintaining a vibrant and cohesive orthopaedic community that is well placed to deliver quality, accessible, and affordable care can only be achieved through partnerships”, said Dr Brian Madison, the President of the Society, in his inaugural speech. The society aims to encourage local and international partnerships to deliver orthopaedic care to remote areas in South Sudan that have no access to this service. We are in the process of joining the International Orthopaedics and Trauma Association (IOTA), a body of twenty orthopaedic associations that promotes international orthopaedic and musculoskeletal trauma care.

In line with the above, and as a continuation of the launch programme, the Society conducted a surgical outreach camp at Juba Military Hospital on the 11th of September 2021. The activities of this one-day event included free orthopaedic consultations, surgeries, and medications. That day, over 200 patients were evaluated and seven were surgically operated on. The numbers were overwhelming, a clear indicator of the viability of such activities.

To achieve its objectives, SOTS decided that it should adopt a hands-on approach. The Society is a registered NGO. This gives it more clout to design and implement projects that will tackle the neglected pandemic of trauma in South Sudan. The Society emphasizes the huge impact of disability from untreated orthopaedic problems on children, women, and the youth who are at the height of their productivity. Through partnerships, we want to help solve this problem.



*At the launch of SOTS. Dr. Mapuor Areu, SOTS Secretary General, Dr. Omojokw Bachay, Vice President, SOTS, Dr. Brian Madison, President, SOTS, Dr. James Alphonse, Senior Consultant Orthopaedics and Trauma Surgeon, and Dr. Stephen Akeri, Representative of the South Sudan Society of Anaesthesiologists. (credit Dr. Aguer Werebek)*

# South University of Medicine, Science and Technology

## A new university with a modern outlook is established in South Sudan

The South University of Medicine, Science and Technology (SUMST) in Juba, South Sudan, is a newly established privately funded University with a modern ethos.

It is located at the compound of the Juba Medical Complex (JMC) in the old part of Juba in a purpose built complex. It boasts modern laboratories, a well-stocked library, lecture theatres, office blocks for staff, dining room and kitchen. It opened its doors to its first intake of undergraduates on the 6th of June 2021.

The main campus will be located about three miles from the current location and will have all the amenities befitting of its status including recreational facilities, and student and staff accommodation. The current facility does not have recreational amenities but has an understanding with nearby recreational facilities.

The flagship courses are in Medicine, Nursing and Midwifery, but a range of other courses are being developed in other areas such as Medical Laboratory Sciences, Radiography and Radiotherapy, Pharmacology, and Human Nutrition and Dietetics. One of the programmes planned is Public Health studies.

The ethos of the University is the development of independent and critical thinking, community cohesion through service without prejudice, problem-based learning to improve understanding of taught material, and rigorous prospective assessments. Objective Structured Clinical Examination skills (OSCE) will be employed to ensure a good grasp of Medical, Nursing and Midwifery skills.

An active staff development programme in various specialties in Medicine, Nursing, Midwifery and Health Sciences is being developed starting with recruitment of Graduate Assistants who will become Lecturers after postgraduate training in universities in the region - followed by further studies in the United Kingdom, Scandinavia, or North America.

Any interested person in the developed world who relishes the challenge of being part of the South University of Medicine, Science and

Technology are welcome to apply for Lecturer posts on a short- or long-term basis. We offer modest remuneration and accommodation and encourage involvement with research at the JMC (which is the University Teaching Hospital with plenty of data awaiting analysis).

The JMC has a Computerised Axial Tomographic scan (CAT scan) and will soon install a Magnetic Resonance Imaging (MRI) machine, the only one in South Sudan.

The image of the new university was taken by Mr Charles Rubena, University Administrator.

For further details contact:

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- Dr Ronald Woro (MD), Chief Physician and Director of JMC (Tel. +211925523371; Email: ronaldworo@yahoo.co.uk)



SUMST Building

# Ban on the use of streptomycin in South Sudan

## A letter to the editor

Dear Editor,

I want to raise a voice in opposition to the recent decision by the South Sudan Ministry of Health (MOH) banning the use of streptomycin. Streptomycin is one of the oldest effective medications for *Mycobacterium Tuberculosis* (TB). It is also relatively inexpensive. As we are all aware, TB is one of the great killers of all time. Although much of the first world considers TB a relic of the past that is currently under control, that is not true of Africa. More deaths from TB occur in Africa than in the rest of the world combined. TB is particularly problematic in South Sudan. There has been an emergence of multiple drug resistant TB (MDR TB), though that scourge is much more prevalent in the first world, at least at present.

In Mary Immaculate Hospital, Mapuordit, South Sudan we see a large number of patients with TB, both pulmonary and extra-pulmonary. As most clinicians know, accentuated breath sounds (and bronchial breathing) in the lungs signify consolidation. Persistence of that finding is virtually pathognomic for TB (pneumococcal pneumonia will give a similar finding, but the accentuated breath sounds usually resolve within hours of starting antibiotics). In our experience, those patients with persisting signs of consolidation after a month or more of therapy with RHZE (rifampin, isoniazid, pyrazinamide, ethambutol) need additional medication. Using Gen X Technology, we have isolated MDR TB once (that patient eventually died despite the use of second line drugs). In other patients, we have had success using streptomycin to treat those patients with signs of persisting consolidation after more than a month of RHZE. We had a recent patient with persisting accentuation of breath sounds after two months of RHZE. He was still positive for TB, but it was not MDR TB. Because of the recent decision of the MOH, we have no alternatives to simply prolonging RHZE treatment.

I do not think the ban is in the best interest of our patients or our country; I am hoping the MOH will reconsider their ban.

**Clarke McIntosh, MD**

Director of Medical Ward,  
Mary Immaculate Hospital,  
Mapuordit, South Sudan





## Dr Marsyano Jada Muludyang



One of his main successes in South Sudan was getting funding from USAID to set up a specialised Children's ward fully equipped with incubators; the ward has since been named after him.

On the night of 25th October 2021 at the Kitwe Teaching Hospital in Zambia, South Sudan lost one of its pioneering medical professionals in the late Dr Marsyano Jada Muludyang.

Dr Muludyang was born on 1st January 1939 in Bilinyang village, Juba, South Sudan. He attended Rejaf Primary and Rumbek secondary schools. He studied medicine at the University of Khartoum for one year before being sponsored by the Catholic Comboni Brothers to continue his studies at the Padua University in Naples, Italy, where he specialized in paediatrics. While in Italy, he also specialised in neo-natal medicine at Legnago.

Following his graduation, Dr Muludyang worked in Ireland for two years before attaining another specialisation in tropical medicine at Liverpool University. In August 1970, he was recruited by the Zambian government with his first posting being at Mbala Hospital, Northern Province, where he worked until 1972. He was then transferred to Kabwe General Hospital and

worked there from 1973 to May 1979. In May 1979, he moved to Arthur Davidson Hospital in Ndola where he worked until 1980 when he was posted to Kitwe Central Hospital where he worked until 1999 holding positions of Head of Paediatrics and twice as Medical Superintendent.

Dr Muludyang retired from government employment in 1999 and set up his own paediatric clinic called Lubambe Children's Medical Centre in Parklands Kitwe which ran from 2000 to 2005, before he was

employed by Wusakile Hospital until to 2010.

When South Sudan gained independence, he returned to the Juba Teaching Hospital as a Consultant Paediatrician. He also worked as Health Services Advisor to the Ministry of Health, Central Equatorial State until July 2016 when he returned to Zambia. One of his main successes in South Sudan was getting funding from USAID to set up a specialised Children's ward fully equipped with incubators; the ward has since been named after him.

On his return to Zambia, he was awarded Zambian citizenship in Aug 2016. He again worked at Wusakile Hospital for a year. From 2018 to his death, he was employed at Tina Medical Centre despite deteriorating health.

Dr Muludyang is survived by his wife Felicia, five children (three sons and two daughters) and ten grandchildren.



**World Health Organization**

The Malaria Vaccine Implementation Programme is a collaboration of the Ministries of Health in Ghana, Kenya and Malawi, WHO, PATH, GSK, UNICEF and partners.

# The RTS,S Malaria Vaccine

A WHO recommended vaccine for added protection against malaria to improve child health, save lives and strengthen malaria control in Africa and in other regions with moderate to high malaria transmission

## Malaria: An enduring health challenge

Malaria remains a primary cause of childhood illness and death in Africa and holds back prosperity in the region.



**400K+**  
DEATHS  
per year

African children are at highest risk

**260K+**  
CHILD DEATHS  
PER YEAR

Malaria has a negative impact on economies



in lost productivity annually worldwide

**70% LOWER** per capita income levels in endemic countries

**UP TO 40%** of public health budget of some African countries goes to treating malaria

Malaria progress has stalled. A tailored, optimal mix of tools – including RTS,S – can get malaria control back on track.



## The RTS,S/AS01 malaria vaccine pilots in Africa

Significantly reduces malaria and life-threatening severe malaria. Since 2019, delivered in childhood vaccination in 3 country-led pilots.



IN 2+ YEARS

**2.3 Million+**  
DOSES



**800K+** CHILDREN VACCINATED

Estimated to be cost-effective in areas of moderate to high malaria transmission



The result of 30 years of research & development

The RTS,S vaccine can be delivered through the existing platform of childhood vaccination that reaches more than 80% of children.

## What we know about the RTS,S malaria vaccine in routine use in Africa



### Feasibility

- Delivery of the vaccine is feasible.
- High, equitable vaccine coverage shown in routine use indicates community demand and the capacity of countries to effectively deliver it.
- No negative impact of vaccination on insecticide-treated bednet (ITN) use, uptake of other childhood vaccines, or care-seeking behaviour



### Equity

- Increases equity in access to malaria prevention: in routine use, the vaccine reached more than two-thirds of children who are not sleeping under a bednet (ITN)
- Layering the tools results in over 90% of children benefitting from at least one preventive intervention (ITN or the malaria vaccine)



### Impact

- 1 life saved for every 200 children vaccinated
- 40% reduction in malaria episodes
- Substantial reduction in deadly severe malaria in routine use
- Impact optimized in highly seasonal malaria settings by providing doses prior to peak "rainy" season



To date, more than 2.3 million doses of the vaccine have been administered - the vaccine has a favorable safety profile.

## Thank you

Thank you to the Ministries of Health of Ghana, Kenya and Malawi for their leadership and commitment to the RTS,S/AS01 malaria vaccine pilot programme. Thank you to Gavi, the Vaccine Alliance, the Global Fund to Fight AIDS, Tuberculosis and Malaria and Unitaïd for their generous support.

Every effort has been made to ensure that the information and the drug names and doses quoted in this Journal are correct. However readers are advised to check information and doses before making prescriptions. Unless otherwise stated the doses quoted are for adults.