

ORIGINAL RESEARCH



Untreated surgical conditions in Malawi: A randomised cross-sectional nationwide household survey

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Abstract

Background

Noncommunicable diseases, such as surgical conditions have received little attention from public health planners in low income countries (LIC) like Malawi. Though increasingly recognised as a growing global health problem, the burden of surgical pathologies and access to surgical care has not been adequately identified in many LIC. Information on the spectrum and burden of surgical disease in Malawi is important to uncover the unmet need for surgery and for planning of the National Health Service.

Methods

This was a multistage random cluster sampling national survey. Households were selected from clusters using probability proportional to size method. 1448 households and 2909 interviewees were analysed. The Surgeons Overseas Assessment of Surgical need (SOSAS) tool was used to collect data. This electronic tablet based questionnaire tool included general information and a dual personalised head to toe inquiry on surgical conditions. The general information included number of household members, and inquired on any death within the past twelve months, and if any of the deaths in the family had a suspected surgical condition leading to that death. Data was collected by specially trained third year medical students.

Results

Out of 1480 selected households, 1448 (98%) agreed to participate, with 2909 interviewed individuals included in the study. The median household size was 6 individuals (range 1 – 47). Median age of interviewed persons was 35 years (range 0.25 – 104 years). 1027 out of 2909 (35%) of the interviewed people reported to be living with a condition requiring surgical consultation or intervention, whereas 146 of 616 (24%) of the total deaths reported to have occurred in the preceding 12 months were reported to have died from a surgically related condition. Most individuals did not seek health care due to lack of funds for transportation to the health facility. Only 3.1% of those that reported a surgical condition had surgical intervention.

Conclusions

There is a large unmet need for surgical care in Malawi. A third of the population is living with a condition needing surgical consultation or intervention, and a quarter of all deaths are potentially avoidable with surgery. Urgent scale up of surgical services and training are needed to reduce this huge gap in public health planning in the country.

Introduction

Noncommunicable diseases, including many surgical conditions, have been neglected for a long time in public health planning in low income countries.¹ Though surgical diseases and injuries are increasingly being recognized as a growing global health problem,¹ the burden of these conditions has not been adequately described in most of Sub Saharan Africa. Some low income countries, including some African nations, have however carried out national surveys to describe the situation in their country, such as Nepal, Sierra Leone, Rwanda and Uganda.¹⁻⁷

Many surgical conditions can lead to avoidable death if there is delay in seeking health care. Conditions such as incarcerated or strangulated hernias, bowel obstruction, appendicitis, peritonitis, congenital anomalies and some tumours can be treated surgically if identified and referred to a surgical facility early enough. Unfortunately, many of these conditions are neglected in low income countries, especially in the rural communities. Traumatic injuries, if neglected, can also cause

significant delay in recovery, permanent disability or death. This can have a profound negative effect on a family's social and economic situation and even the economic development of the whole country.¹⁷

The lack of data on the burden of surgical diseases and injuries in Malawi is a threat to effective health sector planning, and can perpetuate the current under funding of surgical services. The aim of this study was to estimate the burden of surgical conditions in Malawi.

Methods

Setting

Malawi is a low income country in South Eastern Africa with a population of 16.8 Million,⁷ and one of the lowest GDP per capita in the world at USD 294 in 2016.¹³ Only 77 % of public service posts for health personnel are filled, with approximately 40 surgeons in total, of which 20% are in the private sector. With the lowest density of surgeons in the World, Malawi has 0.24 surgeons per 100,000.¹⁶ It is estimated that the number of facilities with adequate staff

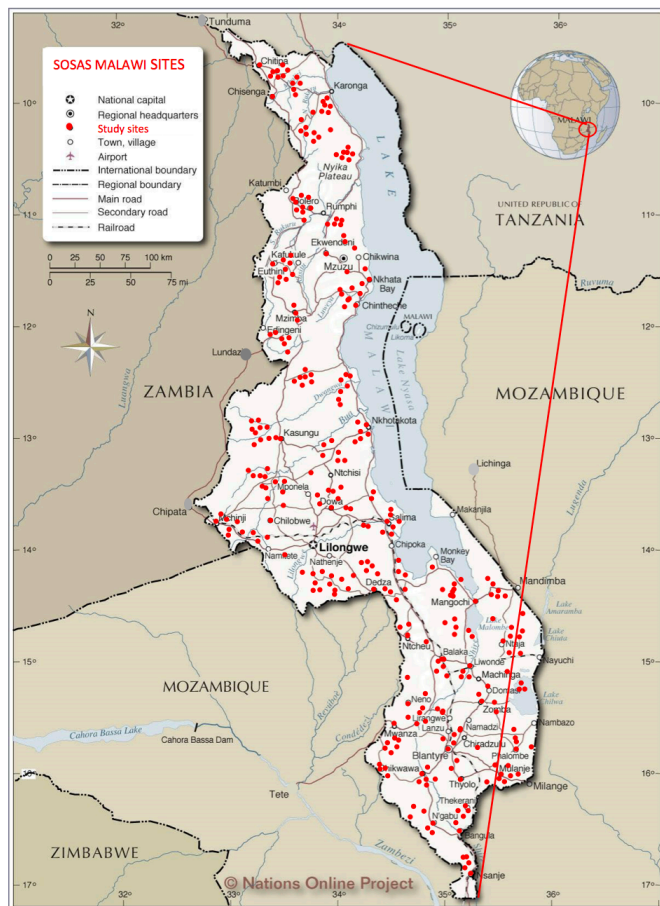


Figure 1: Malawi map showing the areas from which the settlements were selected

to implement the WHO defined Essential health package (EHP) is 9.2 % of the total number of health facilities.⁷ Malawi is divided into North, Central and Southern regions, with the majority (80%, 12.5 million) of the population living in rural areas.¹⁴ The Central and Southern regions are the most densely populated with 6.4 and 6.8 million respectively and the Northern region the least densely populated region.¹⁴

There are a total of 28 districts in the country, with a total number of 48,233 registered settlements (villages and towns). The majority of these settlements are rural communities dependent on subsistence farming and small scale businesses. 27 districts are on the mainland, while 1 district is an island on Lake Malawi.

Study design

This was a cross-sectional multistage national survey. The sample size was estimated to be 1497 households from a pilot study that was carried out in rural areas of the capital city, Lilongwe which estimated the combined untreated surgical conditions to be at 25%. The pilot study preceded the main survey by 5 months to validate the use of the SOSAS tool. The sample size for the individuals was estimated at 2994 individuals (95% CI) with a design effect of 1.5, at a 25 % prevalence of unmet surgical need.

The National statistics office provided the data on settlement areas from the Malawi Census Board for 2008 national census records with 48,233 recorded settlements. All the 48,233 settlements were randomised through computer generated random numbers using an Excel application, selecting 55 settlements as potential enumeration areas from each district on the mainland for this survey. From the selected 55 settlements from each of the districts, 16 per district were selected using probability proportion to size for

sampling. Two or four households were randomly selected in each settlement depending on size. Two households were selected in a settlement with less than 10 households, while 4 households were selected in larger settlements, with more than 10 households. The household randomisation was based on a floor bottle spin and picking the fifth house in the direction of spin. Two household members were selected and interviewed per household, by first interviewing the senior member present, and then selecting another member at random using random numbers based on number of members in the household. When a member of the household under the age of 6 years was randomly selected, the actual information was given by their guardian. The total number of included households was 1448, with a total of 2909 people interviewed.

Survey instrument

The Surgeons Overseas Assessment of Surgical need tool (SOSAS) was used to collect data.^{1,2} The authors received permission to use the SOSAS tool for no cost. This is a questionnaire-based tool with three components. The first component outlines the general household information and demographics. The second part is a personalised interview, with specific questions on symptoms and findings from head to toe, of the same person who gave the general information. The third component involved a random second household member who was also interviewed on any current surgical conditions from head to toe. The questionnaire was installed on a tablet computer (iPad 2, Apple Inc., Cupertino, CA, USA), using FileMaker Pro 12.0v3 (FileMaker Inc., Santa Clara, CA, USA) software. This electronic tablet was also used to capture visible surgical pathologies for certainty. The questionnaire was translated into 2 local languages; Chichewa and Tumbuka prior to installation on the tablet. The collected data was exported from the tablets into an Excel (Microsoft 2010) database at the end of each day in the field for the entire period of data collection.

Data collection

Data collection was done by medical students who had just finished their 3rd year and underwent tool training for 5 days as a refresher of the training for the pilot study. They all underwent ten days of training on how to use the questionnaire and computer tablet prior to the pilot study. There were in total 32 trained data collectors, with 16 interviewers in the field at a time. The period for data collection was from 1st July to 30th August 2016, and was split into 2 phases. The first phase involved half of the data collectors covering all identified enumeration sites in the northern part of the Central Region and the whole of Northern Region. While the second phase involved coverage of the rest of Central region and the Southern Region of the country. In some of the enumeration areas people belonged to smaller population groups with unique languages or dialects. In this case translators were hired to secure good communication. Each data collector was covering 1 or 2 settlements per day to interview 2 or 4 household depending on the size of the settlement; therefore 32 – 64 households were interviewed each day in total. This was confirmed by checking the number of entries at the end of the day for each of the individual data collectors. Random checking of the data entry forms was done at the end of each day to reassure quality of the data.

Table 1: General household information and demographics (N = 1448)

	%
Household data	
Location	
Rural	91.2
Urban	8.7
Median household size (n)	6 (range 1–47)
Respondents	99
Sex distribution	
Male	41
Females	59
Median age (years)	35 (range 0.25–104)
Individual data	
Respondents	98
Education level	
None	19.8
Primary	59.2
Secondary	19.3
Tertiary	1.4
Graduate degree	0.2
Occupation	
Unemployed	30.8
House builder	7.3
Domestic helper	1.9
Farmer	38.2
Own business	15.9
Government employee	2.5
NGO employee	3.5

Statistical analysis

Data analysis was done using STATA 13.1 (StataCorp LP, College Station, TX, USA) and SPSS version 24. Analyses were done for univariate statistics and multivariate logistic regression model was also done to predict the untreated surgical conditions (Present surgical condition yes or no). Chi square tests were used for univariate associations for contingency tables. Normal distribution for data and skewness for data were checked by t-test and Mann-Whitney U test.

Ethical considerations

The study was approved by the Malawi College of Medicine Research Ethics Committee (approval: P03/15/1696), and Norwegian Regional Research ethics committee (approval: 2016/1392/REK Vest). Consent and assent forms were translated into the local languages and used to seek informed consent prior to conducting the interviews.

Table 2: Reported surgical conditions requiring consultation or surgery

Condition	n	%
Wound (injury-related)	177	6.0
Wound (not injury-related)	116	4.0
Burn	45	1.5
Solid mass	258	8.8
Soft mass/reducible	140	4.8
Congenital deformity	124	4.3
Acquired deformity	107	3.7
Abdominal distension/mass	42	1.4
Urological complaints	14	0.5
Rectal bleed	16	0.5
Total	1039	35.5

Table 3: Anatomical locations of conditions requiring surgery

Anatomical region	n	%
Face/head/neck	240	8
Chest	81	3
Abdomen	261	9
Back	63	2
Groin/genitalia	81	3
Extremities	301	10
Total	1027	35

Results

The enumeration areas incorporated all the districts except for Likoma, which is an island where access is only by chartered plane or the once weekly ferry. Figure 1 shows the location of the areas from which the settlements were selected. This was provided by the national census board and was used for randomisation for the survey. The majority of households were rural (91%) while 9% were urban. The median number of household occupancy was 6 (Range 1 - 47) individuals, with a median age of 35 years (Range 0.25 – 104), (Table 1).

Out of the total targeted 1480 households, 1471 households consented and were included, representing 99% of the respondent households and 1448 were analysed data. 2909(98%) out of 2951 individuals consented and were analysed (Table 1). Data from 23 households were excluded due to entry missing values. Nine households refused to give consent for involvement, while 23 individuals refused to give consent, and 42 individuals had missing values on sex and age.

There were 1039 (35.3%; 95% CI 33.8 – 38.6) reported surgical conditions in total (Table 2). In 140 individuals there was more than one complaint existing at the time of the interviews which accounted for the multiple presentation of conditions.

1027 out of 2909 analysed individuals (35%: 95 % CI 32.6 – 37.4) confirmed having a mass, congenital birth defect, burn deformity or contracture, or other surgical condition at the time of interview, and indicated that they required a surgical consultation or intervention. Extrapolated to the population size of Malawi this gives an estimated 5.5 million people living with a surgical condition in Malawi at the time of this study.

Table 4: Comparison of the situation in select African countries and Nepal

Country	Population	GDP/capita (US\$)	Untreated surgical conditions (%)	Mortality from untreated surgical conditions (%)
Malawi	16.8m	294	35	24
Sierra Leone	6.3 m	808	25	25
Uganda	34.6m	726	11	34
Rwanda	12.4m	722	6	33
Nepal	28.5m	689	10	23

By pathology, solid masses were predominant, followed by injury wounds and also congenital defects (Table 2). By anatomic location, the predominant conditions were in the extremities, i.e. conditions of feet, legs, hands and arms followed by abdominal conditions, face, head and neck lesions (Table 3).

597 households reported at least one death in the family in the previous year, with overall 616 reported deaths in the past 12 months. 146 (24%) out of 616 reported deaths were due to a surgically related condition (Table 2). Conditions assumed to be surgical in nature were; traumatic and non-traumatic wounds, abdominal distension, neck and other body swellings; Chest mass, Breast mass, groin mass, limb mass and other visible surface masses.

For multivariate analysis, the parameters used for comparison were, sex, current illness and illness in the past 12 months. Females were more likely to report or seek consultation than males (O.R 2.32 95% CI 2.1 – 2.6). Those that had recovered from the illness in the past 12 months were less likely to report an illness present at the current moment as having a sick health status (O.R 1.67 95% CI 1.21-1.93).

The crude death rate due to surgical disease was estimated at 67 per 1000 population per year (total household occupancy of 8644, 616 dead household members).

Discussion

This study uncovered a huge unmet burden of surgical disease and mortality in Malawi. The findings are comparable to those from other African countries, but, to our knowledge, at 35%, this is the highest reported prevalence of surgical disease in an African Country to date. The unmet need for surgical services in Malawi is evident. Many people are living with a condition needing surgical consultation or surgery. This study also found that 24 % of all deaths reported over the last year were due to a surgically treatable condition.

The SOSAS tool has been used in other Low income countries to estimate the burden of surgical disease and a comparison of the main findings from these countries can be found in Table 4. Our findings in Malawi were similar to those in Sierra Leone, where 25% of the population was found to have a surgical condition and 25% of mortality was estimated to be due to a surgical condition.¹² Malawi is a low income country with a GDP per capita of 294 and a population close to 17 million.^{13,14} Although the Population of Malawi is three times that of Sierra Leone, with a GDP of almost a third of that of Sierra Leone, the estimated unmet need of the burden of surgical diseases is comparable in these two countries. These relatively similar findings of surgical burden and mortality from a surgical related cause when compared to other countries could be explained by

similarities of the general healthcare set up and lack of adequate surgical care at the rural community level (Table 4). The crude death rate is also similar to that of Sierra Leone SOSAS survey, reflecting the inadequacy of health services in these countries. Mortality due to related untreated surgical disease is equally high in other countries that have conducted a SOSAS survey. In Rwanda, Uganda and Nepal, mortality due to a surgical disease was estimated to be even higher than in our study (Table 4).

It has been estimated that in 48 African countries, 288 million people are living with a surgically treatable condition, and that 5.6 million deaths could be averted by surgical intervention annually.⁹ These extrapolated figures from three previous SOSAS studies demonstrate the clear need of surgical care scale up in the African region as a whole. It is high time surgical conditions become a main stream part of the global health discussion.

One of the main limitations of this survey is recall of events, especially deaths, in the household. If the family member died some months prior, the family member could not clearly disclose the cause and circumstances surrounding the death either due to recall effects or that culturally they are not comfortable discussing it. This could contribute to recall and information bias on data collection although the information was confirmed from the deceased person's health passport book if available, or from the household head.

Another limitation could also be the reporting and description of the surgical condition. This was based on inquiry of the condition, and not examining the persons with their complaint. This would have required extra time, and more medically qualified enumerators, to conduct the physical examination on them. But realistically for a resource limited country like Malawi, it would not be feasible to get 30 medically qualified clinicians out for a 60 days' national survey and deprive the health facilities from service provision. Hence it was not possible within the timeframe and budget of this study. Some of the conditions, though interpreted as surgical, were not confirmed as such, and could have been wrongly classified. However, the opposite is also possible, and we do not think this is a major bias. Some congenital conditions, like cardiac septal defects, are not easily diagnosed without clinical examination. Some conditions like umbilical hernias or other body swellings are sometimes not considered as a problem, especially if some other family member has had a similar condition and it never caused any problem. So this required a lot of inquiry without actually examining the condition, otherwise it could be presented as a normal finding.

There are many other causes of mortality from communicable diseases, like malaria, tuberculosis and immune suppression

related illnesses. Some of these conditions are not in isolation, but coexist with some surgical illness. Not all will require a surgical procedure for intervention, but even just a surgical consultation. This could either raise the incidence or vice versa if the diagnoses is missed.

Some surgical conditions are believed to be inherited and not harmful, like hernias and hydroceles. This could be one of the reasons the communities believe there is no need for them to seek health care from the facilities. Other communities believe the condition they have cannot be treated or even associate the condition with witchcraft. This may have been a contributing factor to not seeking health care for some.

Misunderstandings due to language could be another limitation. Malawi has 2 official languages; English and Chichewa, but many areas also have their own local languages. Though interpreters were engaged, some descriptions of medical conditions needed thorough explanation to understand what they were referring to. The questionnaire was only translated into 2 local languages, Chichewa for the central and the southern region, and Tumbuka, mostly spoken in the northern part of Malawi.

Some traumatic conditions are seasonal in Malawi, such as the high frequency of falls from trees in the mango season and collapsing houses during the rains, and therefore could not be captured fully in this study conducted in the cold, dry ("winter") season. In winter, burns are more common due to people using fire in their houses to keep warm.

In the rural areas of Malawi, transportation costs are high for people with little cash income, and the roads often become muddy and un-serviceable during the rainy season. Many people in the rural communities either present late, or do not present at all to the health facility due to transport problems, lack of funds, or not knowing the need to visit the health facility.¹⁵ Others get discouraged because the local health centre will not have the necessary equipment and drugs.¹⁰ They would rather wait till they have sourced enough funds to enable them to visit a secondary level health facility, a district hospital, or even a tertiary centre, a central hospital, of which only 4 exist for the entire population of 16 million. These district hospitals and central hospitals are usually far from these rural communities, and also faced with inadequate supplies and inadequate human resource to offer the services.¹⁰⁻¹² These economic, social and geographical factors can all lead to delay in contacting the health system and explain why so many people are living with untreated surgical conditions.

Untreated surgical conditions are widespread in Malawian rural communities and there is a large potential to prevent the complications of such conditions if presentation to a health facility that can provide good surgical service is done early enough. With the knowledge of this, it could be sensible to promote community awareness of certain common pathologies that can be surgically treated. Alignment of funds for programs addressing surgical conditions by training health care workers to recognise, treat or refer surgical cases to the appropriate level of care in a timely manner could have a large impact. Surgical team visits could also be organised to rural areas by specialists from the central hospitals to make travel less of a barrier for the population in order to get health care. Strengthening of the surgical capacity in Malawi is urgently needed. With the severe resource limitations in Malawi, surgical service scale up can be most efficiently reached by sufficient support of the existing surgical training

programmes in the main cities. Once a critical mass of surgeons has been trained, they can expand outreach services to district hospitals and rural health centres with the goal of also producing surgeons for the districts in the future.

Conclusions

This study has uncovered a huge unmet burden of surgical disease and mortality in Malawi. One-third of the population is living with a surgically correctable condition, and one quarter of all reported deaths is potentially avoidable with surgery. Urgent scale up of surgical services and training programmes are needed to reduce this huge gap in public health service in the country.

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Competing interests

All authors declare that they have no competing interests related to this work.

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