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ESTIMATION OF MATERNAL MORTALITY USING THE INDIRECT SISTERHOOD METHOD IN SULEJA, NIGER STATE-NIGERIA.

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ABSTRACT

There is an unprecedented expressed need and demand for estimates of maternal mortality in developing countries due to lack of vital registration. The objective was to assess maternal mortality ratio, life time risk of dying from maternal causes and the proportional maternal mortality rate in Suleja LGA of Niger state. This was a community-based cross-sectional descriptive study. Cluster sampling technique was used to sample 2704 respondents from 4 wards. Data was collected using the original 4 sisterhood questions[2]. In this study, there were a total of 1094 deaths out of which 174 were maternal deaths. Maternal Mortality Ratio (MMR) was 400 per 100,000 live births and a life time risk (LTR) of dying from maternal causes during the whole of her reproductive life is 0.023 (or 1 in 43 women.) It can be concluded that M M ratio and life time risk of maternal death were high in Suleja LGA. Achieving the 5th MDG will require accurate estimates of maternal deaths and provision of health care delivery services that are accessible and affordable to pregnant women.

INTRODUCTION

Maternal mortality rates are difficult to measure especially in the developing world where vital statistics are virtually non-existent or incomplete[1] and maternal deaths are hard to identify because of inaccurate reporting. This occurs frequently with first trimester maternal death.[2]

Maternal mortality is a huge problem in many developing countries; unfortunately Nigeria is not an exception. Crucial though, it is a complex measure of a country's overall health and developmental status.[3] It is very hard to estimate the real figure as only 31% of women deliver in health care facilities, many others are assisted by traditional birth attendants (TBAs). Maternal mortality is also a very hard event to monitor due to poor reporting and lack of proper methods to measure actual death rates[3]. The expensive nature of household (HH) surveys led to the development of the cost effective 'Sisterhood' method during the late 1980s[4] which has the advantage of a small sample size requirements compared to other methods. The method is a retrospective estimate of maternal mortality and thus its use is limited in circumstances where current estimate is needed. However, despite this drawback it is a useful and reliable method of estimating maternal mortality[5] and has been validated by several studies.[6,7,8]

The most common direct causes of maternal deaths in developing countries include haemorrhage, sepsis, eclampsia, unsafe abortion and obstructed labour.[9] In Nigeria unsafe abortion is a major

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contributor to maternal mortality. It has been reported that more than 3,000 women being treated in hospitals for complications from such procedures die each year.[9, 10] Since many women having unsafe abortions die before reaching a health care facility, the true number of such deaths is likely to be much higher.[11] According to World Health Organization, 13% of maternal deaths in 2003 in West Africa of which Nigeria is the largest country were due to unsafe abortions.[9] More than one factor may have contributed to maternal death in some cases. The leading indirect causes of maternal mortality are hepatitis, anaesthetic death, meningitis, HIV/AIDS, sickle cell anaemia, and acute renal failure. Maternal mortality is a symptom of poverty and the low status accorded to women, illiteracy is also found to be closely associated. This problem is further compounded by the fact that majority of these women are also not booked for antenatal care.[9, 10, 12-15]

Of all the health statistics compiled by the World Health Organization (WHO), the largest discrepancy between developed and developing countries occurred in maternal mortality. The WHO attempted to face this challenge, by making 'Safe Motherhood' the theme of its World Health Day in 1998. The aims of the WHO are encapsulated in its Mother-Baby Package which is based on the 'four pillars of safe motherhood.[10] There is strong indication for improved action for maternal mortality reduction.[16]

The Safe Motherhood Initiative was launched in 1987 to raise awareness of the world's high maternal mortality levels and to find ways to reduce these numbers.[2] The goal of reducing maternal mortality has been adopted by a series of international health and development conferences and forms an integral component of the programmes of action following the 1990 World Summit for Children, the 1994 International Conference on Population and Development and the 1995 Fourth World Conference for Women[3]. It has been included within the Millennium Development Goals (MDG- 4 & 5.),[16] and many countries have also accepted it as a national goal.[3] Recently, the Integrated Maternal Newborn and Child Health (IMNCH) strategy was developed to meet the target date for attaining the MDG-5. In particular, this strategy was designed to provide a new way of thinking and to promote an integrated approach to reducing maternal, newborn and child mortality in Nigeria.[9] The dearth of data on maternal mortality prompted this study to estimate maternal mortality ratio (MMR) using the Sisterhood method in Suleja LGA of Niger state in north central geo-political zone of Nigeria.

Methods

Suleja local government (LGA) is one of the twenty-five LGAs in Niger state in North Central geopolitical zone of Nigeria. It has ten wards and total population of 215,075[17] with Hausa, Gbagi, Gwandara and Koro as major ethnic groups. This was a community-based cross-sectional descriptive study in which information on sibling survivorship (Sisterhood method) was used to derive estimates of maternal mortality ratio. Maternal death as defined by the World Health Organization in the International Classification of Disease (ICD-10),[18] is the death of a woman while pregnant or within 42 days of termination of pregnancy or its management but not from accidental or incidental causes.

Data was collected from respondents, men and women born of the same mother aged 15-49 years using interviewer-administered open-ended, uncoded

questionnaires. The questionnaire was divided into two parts, the first part contained general socio-demographic characteristics of respondents, while the second part contained the four original Sisterhood questions (below):

1) How many sisters have you ever had, born to the same mother, who ever reached the age of 15 (or who were ever married) including those who are now dead?

2) How many of these sisters reaching age 15 are alive now?

3) How many of these sisters are dead?

4) How many of these dead sisters died while pregnant or after the end of pregnancy?

The sample size of respondents was calculated based on the assumption of the proportion of respondents to maternal death questionnaire to be 50%, and a tolerable error of 5%. This was to increase the sample size and precision as a previous study used 45%.[19] In order to allow for the cluster sampling design effect, the value was rounded to the next 1000. The figure was increased by 10% for possible none or poor responses. Each of the ten wards of the LGA formed a cluster out of which 4 clusters were randomly selected through balloting. The sampling frame was the list of all the ten wards of the Local Government Area (LGA) that was obtained from the local government authority. Sample size was proportionately allocated to the four wards (Table I). In each of the selected cluster, all eligible respondents were sampled and all the households were visited and data collected from adult males and females. The survey was simultaneously conducted in the four wards over a seven day period by trained research assistants (RAs). The RAs were given a 2-day training to acquaint them with the instrument for data collection and for the purpose of uniformity in data collection. The RAs were fluent in both English and local languages of the respondents to ensure clarity of word meaning. Emphasis was placed on the word "sister" who has different meaning in many cultures. The formula used for calculating adjustment factors and life time risk (LTR) are reproduced from the original article.[4]

Approval for the study was obtained from ABUTH Ethics committee and permission from various community leaders and household heads for cooperation. Verbal informed consent was obtained from respondents who were assured of confidentiality of data collected. Data was analyzed using SPSS version 12 and the method described by Graham et al.[4]

Results

In total, 2704 respondents were interviewed. There were 1761 females and 943 males respectively. Majority of respondents were Hausa (69.1%), Moslem (90.2%) and with only Quranic/Islamic education (30.7%) respectively. The age groups 30 – 34 and 40 – 44 had the highest number (562 and 416) of respondents, however the number of maternal deaths was higher in age group 25 – 29 and 45 – 49 years respectively, Table II. In this study, life time risk (LTR) was 174/7491 = 0.023 (1 in 43 women) or approximately a 2.3% chance to die from maternal causes during reproductive life.

A total of 1094 deaths were recorded, out of which 174 were maternal deaths. The calculated maternal mortality ratio (MMR) was 400 per 100, 000 live births. Both maternal mortality ratio and the lifetime risk of dying of maternal causes were

Table I: Socio-demographic characteristics of the respondents in the four wards of Suleja LGA (n=2704).

Socio-demographic characteristics	Frequency	%
Wards		
Hashimi A	772	28.6
Hashimi B	783	29.0
Magajiya	748	27.7
Kurmin Sarki	401	14.8
Ethnic groups		
Hausa	1868	69.1
Gwari	360	13.3
Koro	65	2.4
Gwandara	43	1.6
Others (e.g. Nupe, Yoruba)	368	13.6
Religion		
Islam	2439	90.2
Christianity	262	9.7
Others (traditional)	3	0.1
Educational level		
Quranic/Islamic	857	31.7
Primary	332	12.3
Secondary	805	29.8
Tertiary	533	19.7
None	169	6.3
Others (literacy education)	8	0.3
Total	**2704**	**100**

Table II: Analysis of proportional maternal mortality and lifetime risk of maternal death in Suleja L.G.A

A age group of respondents (years) = 1	B Number of respondents	Cn Number of ever married sisters reported	C *adjusted number of ever married sisters reported = N^1	D Number of maternal deaths = r^1	E Number of deaths due to other causes	F Total Sisters dead	G Proportion of maternal deaths (%)	H ** adjustment factor = A^1	I Sister units of risk of exposure = B^1 = (i=ch)	J life-time risk of dying a maternal death $D/I=r^1/B^1=q(w)$
15-19	195	465	2381*	4	33	37	10.8	0.107	255	0.016
20-24 424	116	69	18 70	20.5	0.206	11	0.015			
25-29 483	138	81	37 98	25.4	0.343	24	0.015			
30-34 562	175	165	84 172	49.4	0.503	88	0.039			
35-39	344	1108	1108	16	145	161	9.9	0.664	736	0.022
40-44	416	1433	1433	28	214	242	11.6	0.802	1149	0.024
45-49	280	955	955	37	187	224	16.5	0.900	860	0.043
Total	2704	8214	20418	174	920	1094	15.9		7491	0.023

*Column C shows adjusted figures for age groups 15-19, 20-24 and 25-29 years[3], ** Column H shows the adjustment factors[3]

Where D = number of maternal deaths

I = sister units of risk of exposure

r^1 = number of maternal deaths in i^{th}, age group

B^1 = the number of sisters entering the reproductive period in the age group i adjusted to get the sister units of exposure to the risk of maternal death over the whole of reproductive period.

q = probability of dying from maternal causes

w = probability of death due to maternal causes by the end of reproductive age

calculated using the formula:
$q(w) = r_i/B_i = (w)\,Q = r/B = 174/7491$

The risk (Q) of lifetime mortality from maternal causes is estimated from the number of sisters' deaths reported by respondents (r) as a fraction of the number of the sisters' unit of exposure (B), (Table II). Therefore, the lifetime probability of avoiding death for maternal causes is
$P = 1 - Q$.

Maternal mortality rate can be computed from the approximation, $MMR = 1 - (P)^{1/TFR}$
Maternal mortality ratio (MMR) = 1 – (Probability of survival)

= 1 – (1 – lifetime risk of dying a maternal death)

= $1 - (1 - ri/B^1)^{1/TFR}$

Total fertility rate (TFR) for Nigeria = 5.7[17]
Therefore, MMR

= $1 - (1\text{-}0.023)^{0.175}$

= $1 - (0.077)^{0175}$

= $1 - 0.996$

= 0.004

= 400/100,000 live births

The lifetime risk (LTR) of maternal death was calculated to be 174/7491 = 0.023 (or 1 in 43 women) or approximately a 2.3% chance to die from maternal causes during reproductive life. Table II displays the necessary data and the steps involved in the calculation of the maternal mortality ratio and the lifetime risk of maternal mortality from the sisterhood methods.[5,19]

Discussion

Maternal mortality has remained a serious public health problem in developing countries. In this study, the age distribution of the respondents is in conformity with that of other studies from Jos, Nigeria and Tanzania respectively.[20,21]

The Maternal mortality ratio in this study was 400 per 100,000 live births which was high but consistent with studies on maternal mortality ratio done in other parts of Nigeria.[20,22] However, it is well below the national average of 545 maternal deaths per 100,000 live births.[23] Although this report was not disaggregated to reveal zonal rates, the recent national survey had reported a much higher maternal mortality ratios for the northern areas compared to the southern Nigeria. The high MMR in this study could be due to the fact that majority of women in Nigeria still deliver at home where there are no medical facilities and are therefore at more risk of maternal death. This study was a first of its kind conducted in this part of Nigeria using the indirect sisterhood method. The study area does not have any previous data on maternal mortality, thus, this study served as a baseline data. Baseline data are crucial for tracking progress on outcomes of interventions and services effectively and assessing the pursuant of targets and efforts at reducing maternal mortality.[24]

The MMR reported in this study is unacceptably high since the causes of maternal deaths and their prevention are well known. This is worrisome in the light of efforts by all tiers of government towards achieving the MDGs. Importantly, it will be necessary to reduce fertility through family planning, increase health care financing, availability of resources for quality health service delivery and investment in human capacity.[24] Furthermore, effective, inexpensive and implementable evidence-based interventions are now available in the integrated maternal newborn and child strategy (IMUCH) with which these deaths can be averted. In this study, the highest proportion of maternal deaths when

compared to other deaths was in age groups 25- 29 and 45 – 49 respectively. This might be due the fact that at these age groups pregnancy is associated with high maternal risk. Additionally, in the later group this can be compounded with frequent child bearing especially in these communities where early marriage is widely practiced.[25] Again most of the respondents received only Quranic/Islamic education, while 19.7% had tertiary education. This low educational status might possibly reflect those of their deceased sisters and thus will imply that illiteracy was a contributory factor to their death as reported in previous studies.[9,25, 26] So efforts at preventing maternal mortality in this community most address illiteracy through adult literacy education programme for women coupled with the need to improve and sustain girl-child education enrolment and their retention in schools. Improvement in literacy level of women could increase knowledge on contraception and also promote the utilization of maternal health services in the community.

The high maternal mortality ratio reported in this study is a preventable mortality. In the absence of efficient and reliable vital registration, the sisterhood method is a satisfactory method of estimating maternal mortality; even though it captures retrospective rather than current events. It is also useful for monitoring the trends of maternal mortality and evaluating the impact of safe motherhood initiative and improving maternal survival and achieving the MDGs.

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