ASSESSMENT OF THE IMPACT OF LEVEL OF MATERNAL EDUCATION ON MATERNAL DEATHS IN EASTERN REGION OF GHANA; A HUMAN RIGHTS-BASED APPROACH

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Abstract

Objective: The Human Rights-based Aproach to Social Development aims to positively transform power relations among duty bearers and rights holders with particular attention on social, economic, and cultural rights. This study analyzes the impact of formal education, (an inalienable human right progressively predicting better health, longer life and better health services utilization), on maternal mortality.

Methodology: A retrospective descriptive audit of all institutional maternal death records was completed for data abstraction. All records were assessed for consistency with the ICD-10 maternal death case definition. Data were analyzed across documented levels of education with epi info 3.5.1.

Results: Mean maternal age was generally higher among women with ≤ JHS level of education. Mean gestational age at death varied insignificantly across all levels of education. Women with JHS level of education accounted for the highest proportion of maternal deaths while deaths among women with ≥ SHS level of education, (i.e. ≥ 12 years of formal education), remained low. Deaths among women with informal occupations decreased with increasing level of education. Maternal deaths among women with ≤ JHS level of education occurred in higher proportions among women with spouses or partners of similar levels of education. Women unexposed to formal education poorly attended ANC, mostly needed blood transfusions and were further largely grand multiparous.

Conclusion: All female gender-specific socio-economic, socio-cultural, geographical and religious barriers to accessing ≥ 12 years of formal education should be a research priority and targeted for elimination within the context of the HRBA.

Key Words: *Maternal mortality, maternal death, human rights-based approach to maternal health*

Introduction

The Human Rights-based Aproach to Social Development, HRBA, (promoted by many development agencies, and Non-governmental organizations, NGOs) aims to achieve positive transformation of power relations among duty bearers, (the institutions obligated to fulfill the holders' rights) and rights holders (who do not experience full rights).[1] It prioritizes strengthening capacities of duty bearers while empowering rights holders.[1] While human rights organizations formerly focused on political and civil human rights violations, current attention has shifted to social, economic, and cultural rights.[1] Evolution of human rights, (transitioning from a welfare model and the western idea that rights are asserted through responsibilities, duties, transparency, trust, and accountability), led to the development of the HRBA.[1] The Secretary General to the United Nations (UN) called on all UN agencies to mainstream human rights into all work of the UN in 1997 based on the six underlying principles. They include universality and inalienability, indivisibility, inter-dependence and inter-relatedness, equality and non-discrimination, participation and inclusion and accountability and rule of law.[1] Achieving health goals is generally dependent on increasing access to key interventions whose broad deployment may simply still not be enough.[1] The UN human rights Council highlighted maternal mortality as a health outcome of human rights concern because an estimated 98% are preventable.[2] The Convention on Elimination of all Forms of Discrimination Against Women (CEDAW) is the only human rights treaty that affirms the reproductive rights of women.[2] Gender discrimination, poverty, lack of formal education, inadequate health services, restrictive abortion legislation etc. comprise explanatory factors that underlie and predict maternal deaths.[2] CEDAW indicated that states had human rights responsibilities to guarantee women of all racial and economic backgrounds timely and non-discriminatory access to appropriate maternal health services.[3] Human rights are fundamentally violated when pregnant women or parturients endure preventable suffering that includes morbidity, mortality, injury, mistreatment, abuse, discrimination and denials of information.[4] The HRBA to women and children's health, (increasingly gaining acceptance among a diverse range of stakeholders), has renewed attention to the need to establish links between women's socio-economic characteristics and health.[5] Formal education, (a human right), constitutes an

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indicator of social position frequently used in international surveys to explore social inequalities.[6] Progressively higher education is linked with better individual health, longer life, better utilization of health facilities etc.[6] Women's level of education, (relative to those of men), is linked with adverse maternal health outcomes when low.[6] Lack of formal education is highlighted as an important stressor associated with limited finances and decision-making power which affects women during pregnancy and childbirth. This creates vulnerability and increases the likelihood of adverse maternal health outcomes.[6] While recognizing formal education as an inalienable human right important for averting adverse maternal health outcomes, this study analyzes its impact on maternal deaths among women who died in health care facilities in the Eastern Region of Ghana.

Materials and Methods

The study was carried out as a retrospective descriptive audit of all institutional maternal deaths that occurred in the Eastern Region of Ghana between 2011-2016. The retrospective audit started with records dated 2011 as this constitutes the year when the old maternal death audit form transitioned into the current audit form that is comparatively more comprehensive and thus more informative. Records on maternal deaths were acquired from the Eastern Regional Health Directorate. They were meticulously reviewed for abstraction of the study's variables after careful test of consistency of all documented deaths with the with the ICD 10 maternal death case definition. Of the total 526 maternal death audit forms retrieved covering the period 2011-2016, 479 were included through non-probability sampling. The primary inclusion criterion was a record's consistency with the maternal death case definition of ICD 10. Maternal deaths documented to have occurred at home or prior to arrival to a health facility were excluded. They were defined community deaths. Of the 47 audit forms excluded, 22 were suggestive of deaths that occurred on the way to health facilities while 25 records did not indicate the place of death. The later, (i.e., deaths of unspecified locations), were also classified as non-institutional maternal deaths. Referred cases, (whose demise occurred prior to arrival to the referral health facility), were included. They were adjudged cases of the health facility that referred them as part of the continuum of clinical care. Their inclusion into the Eastern Region's institutional maternal deaths is premised on the fact that they were received by a health facility within the Region, managed and referred for further care prior to their demise. Deaths preceded by ingestion of potentially toxic substances, (e.g. herbal preparations or other unspecified substances), were also included. Assumptions of this study held that the primary objective to their ingestion was not suicide but for the termination of unwanted pregnancies. Such substances observably, (from available death audit records), may have triggered a complex cascade of processes that largely ended in direct maternal deaths. Levels of education were analyzed on a five-step scale (in accordance with Ghana's general educational structure) as follows; nil or no exposure to formal education, primary, junior high school (JHS), senior high school (SHS) and tertiary levels of education. Urban or rural community status were defined in accordance with specifications of the Ghana statistical service that classify communities with populations of ≤ 5000 as rural. All data were analyzed with epi info 3.5.1.

Results

The mean maternal age and standard deviation (SD) from the mean maternal age varied insignificantly across the various levels of education. The mean maternal age was generally higher among women with ≤ JHS level of education. With the exception of women of tertiary level of education, maternal ages were characterized by high variability. [**Table 1**].

Table 1. Maternal deaths analyzed by levels of education and characteristics of central tendency, 2011-2016

Levels of education	Maternal age		
	Mean	SD	Variance
Nil education	29.1	7.3	54.1
Primary school	29.6	8.1	66.1
Junior High School	29.2	6.8	46.5
Senior High School	27.1	5.9	35.5
Tertiary	28.3	4.4	19.9

The mean gestational age at death varied insignificantly across maternal levels of education from women unexposed to formal education to women with tertiary level of education. [**Table 2**].

Table 2. Maternal mortality analyzed by mean gestational age at death and levels of education, 2011-2016

Levels of education	Gestational Age - %		
	Mean	SD	Variance
Nil education	30.6	9.5	90.2
Primary school	31.2	9.8	96.2
Junior High School	34.6	7.8	61.7
Senior High School	32.9	11.6	134.8
Tertiary	34.2	8.9	80.6

Maternal deaths were recorded in the highest proportions among women with JHS level of education and remained observably lowest among women of ≥ SHS levels of education. Among women with ≤ JHS level of education, deaths increased with increasing exposure to formal education from women unexposed to formal education through to JHS level of education. [Table 3].

Table 3. Maternal deaths analyzed by levels of education, 2011-2016

Levels of education	Maternal deaths - %
Nil education	20.7
Primary education	20.9
Junior High School	46.7
Senior High School	7.0
Tertiary	4.7

While women unexposed to formal education recorded peak maternal deaths in the age group 21-30 years, deaths among women with a primary level of education observably peaked in the age group 31-40 years. Variations in levels of education among maternal deaths of women of the other age groups remained insignificant. Maternal deaths marginally varied between women resident in urban and rural communities; rural residents generally, however, recorded more maternal deaths. Peak maternal deaths observably occurred among women of JHS level of education for both urban and rural residents. It, however, generally remained comparatively lower among women resident in urban and rural communities with ≥ SHS level of education. Deaths among women with lower levels of education, (i.e. ≤ JHS), with traceable addresses occurred in lower proportions while women of higher levels of education, (i.e. ≥ SHS), contrarily accounted for higher proportions of maternal deaths among women with traceable addresses.

Maternal deaths analyzed by marital status showed that they occurred in lower proportions among both married and single women with ≥ SHS levels of education. Maternal deaths among women documented to have informal occupations decreased with increasing levels of education. Deaths among women with formal occupations were recorded in the highest proportions among women with tertiary level of education. Maternal deaths among women of ≤ JHS levels of education occurred in higher proportions among women with spouses or partners of similar levels of education. Notably, however, the proportion of maternal deaths also observably decreased inversely with increasing spousal or partner's levels of education and spousal or partner's formal occupation status. Women with spouses or partners of tertiary level of education had the least representation among maternal deaths. While direct maternal deaths reduced with increasing level of education, indirect maternal deaths contrarily increased among women with ≥ SHS level of education (despite an insignificant dip recorded for women with JHS level of education. Maternal deaths were, however, generally lower among women with higher levels of education, (i.e. ≥ SHS). [**Table 4**].

Table 4. Maternal deaths analyzed by maternal age, residence, address traceability, marital status, occupation, death type and levels of education, 2012-2016

Characteristic	Levels of education - %				
	Nil	Primary	Junior High	Senior High	Tertiary
Maternal age					
≤ 20 years	11.1	18.3	10.6	12.9	0.0
21-30 years	42.2	34.4	47.8	64.5	61.9
31-40 years	41.1	40.9	37.7	19.4	38.1
≥ 41 years	5.6	6.5	3.9	3.2	0.0
Area of residence					
Urban	12.2	22.4	48.1	9.6	7.7
Rural	21.9	20.9	50.7	5.0	1.5
Traceability of address					
Traceable	10.9	21.4	53.0	9.4	5.3
Not Traceable	35.3	20.8	37.0	3.5	3.5
Marital status					
Married	20.0	21.1	47.1	6.6	5.1
Single/ unclear	22.8	20.7	44.6	8.7	3.3
Occupation					
Formal	0.0	2.4	0.5	19.2	90.5
Informal	100	97.6	99.5	80.8	9.5
Partner's or spousal occupation					
Formal	0.0	0.0	10.0	9.1	66.7
Informal	100	100	90	90.9	33.3
Maternal death type					
Direct	69.4	71.6	74.9	60.7	68.4
Indirect	30.6	28.4	25.1	39.3	31.6

Maternal deaths preceded by blood transfusions, (as part of the continuum of clinical management of a cascade of obstetric complications leading to death), had a comparatively higher representation among women unexposed to formal education. The differential occurrence of maternal deaths among women with ≥ SHS level of education remained low irrespective of prior blood transfusion status. Notably high maternal deaths were documented among women unexposed to formal education who did not attend ANC during pregnancy. This, however, varied insignificantly across the other levels of education (i.e. ≥ primary school level of education). While maternal deaths increased with increasing level of education among ≤ biparous women, deaths among ≥ multiparous women decreased with increasing level of education. The trimester of occurrence of maternal deaths varied insignificantly across all the levels of education. The lowest mortality burden was however still recorded among women of ≥ SHS level of education irrespective of analyses by trimester of occurrence of maternal death.

The majority of maternal deaths that occurred following spontaneous vaginal delivery, (SVD), occurred among women unexposed to formal education. The trend of maternal deaths that occurred following the performance of a cesarean section, (as part of the continuum of clinical management of a cascade of obstetric complications leading to death), increased with increasing level of education. This trend peaked among women with tertiary level of education. The trend of maternal deaths preceded by expulsion of the conceptus ≤ 27 completed weeks of gestation, (as part of a cascade of obstetric complications preceding death), remained marginally highest among women unexposed to formal education. This trend peaked among women with tertiary level of education. Third trimester maternal deaths were recorded in the highest proportions among women with tertiary level of education. Maternal deaths predominantly occurred in advanced pregnancy, (i.e. ≥ 28 completed weeks of gestation), across all levels of education. [**Table. 4**].

Table 4. Maternal deaths analyzed by blood transfusion, ANC attendance, parity, gestational age, pregnancy outcome and levels of education

Characteristic	Levels of education - %				
	Nil	Primary	Junior High	Senior High	Tertiary
Blood transfusion status					
Transfused	14.1	23.1	51.3	8.3	3.2
Not transfused	25.5	19.4	42.9		
ANC attendance					
Attendant	17.0	20.7	50.0	7.2	5.2
Not attendant	36.4	22.1	35.1	5.2	1.3
Parity					
≤ Bipara	26.7	35.6	42.4	60.0	83.3
≥ Multipara	73.3	64.4	57.6	40.0	16.7
Gestational age at death					
≤ 12 weeks	9.1	11.8	9.4	14.8	0.0
13-27 weeks	15.6	11.8	12.2	11.1	18.8
≥ 28 weeks	75.3	76.3	78.5	74.1	81.3
Delivery/abortion status					
SVD	33.0	32.2	32.4	13.8	10.0
CS	21.6	31.0	36.7	44.8	45.0
≤ 27 weeks	14.8	11.5	7.4	10.3	5.0
Conceptus in situ	30.7	25.3	23.4	31.0	40.0
Time of admission					
00:00-06:59	20.9	7.8	15.8	11.5	31.3
07:00-12:59	26.9	35.3	25.2	26.9	50.0
13:00-17:59	26.9	29.4	33.1	42.3	18.8
18:00-23:59	25.4	27.5	25.9	19.2	0.0
Time of death					
00:00-06:59	33.3	16.3	25.4	18.5	37.5
07:00-12:59	16.7	22.4	24.6	29.6	18.8
13:00-17:59	25.8	24.5	24.6	33.3	12.5
18:00-23:59	24.2	36.7	25.4	18.5	31.3

Discussion

The Human Rights-based Aproach to Social Development, HRBA, (applicable to all aspectcs of development), aims to achieve positive transformation of power relations among duty bearers and rights holders.[1] Formal education, a human right, (and an indicator of social position frequently used in international surveys to explore social inequalities), is linked with better individual health, longer life, better utilization of health services etc.[6] Findings of this study showed that women with ≥ SHS level of education, (i.e. women with ≥ 12 years of exposure to formal education), accounted for the lowest maternal death burden in the Eastern Region of Ghana between 2011-2016. This pattern was consistently not amenable to maternal age, urban or rural place of residence, traceability of address, marital status, formal or informal occupations, direct or indirect maternal deaths, blood transfusion status, ANC attendance, parity, gestational age and trimester of gestation. Findings of this study descriptively supported findings of a study that reported that women unexposed to formal education were about three times as likely to die during pregnancy or delivery. The compared study further indicated that women exposed to one and six years of formal education had twice the risk of maternal death of women with ≥ 12 years of formal education.[6]

Boosting female education may be an important policy lever for averting maternal deaths.[7] Emphasis on formal education as a factor (among other important factors) in maternal death is seldom stated.[7] Literature in economics widely documents positive correlations between formal education and other indicators of good health.[7] Findings from a study completed in 29 countries in Africa, Asia, Latin America, and the Middle East reported significant associations between low education

and severe adverse maternal health outcomes (i.e. maternal near miss and maternal death).[8] This relationship persisted in countries with medium and low Human Development Indices (HDI).[8] As descriptively supported by findings of this study, Tunçalp Ö. *et al* indicated that less educated women also had increased odds of presenting to the hospital in a severe condition (i.e. with organ dysfunction on arrival or within 24 hours).[8]

Findings of this study were consistent with findings of a study in Peru that examined the causal effect of women's education on maternal health.[9] The study posited that extending women's years of schooling significantly reduced the probability of several maternal health complications at last pregnancy or birth.[9] Few studies have however been able to determine whether women's level of education has a *causal* effect on maternal health or whether the link between the two is attributable to factors correlated with both, such as household wealth or poverty.[9] Within countries, maternal deaths have largely occurred among the poorest and least educated women who are most vulnerable to maternal death and disability.[10] A World Health Organization (WHO) report on Asia and the Pacific also indicated that maternal death significantly reduces commensurately with increasing female literacy.[10] Unmet need for contraception, (key to averting adverse maternal health outcomes), is mostly prevalent among women who are poor, less educated, younger, and living in rural areas.[10] UNSESCO data also strongly supports the established positive associations between education and social development. UNESCO indicates that exposure of all women to primary education could contribute to reduction of maternal deaths by about 67%.[11] This assertion was however contrary to findings of this study as exposure to primary level of education did not positively impact maternal deaths. Formal education importantly enhances women's capacity for timely recognition of danger signs, quick decision making, etc.[11]

A scientific analysis of 50 years of maternal death data from Chile identified maternal level of education as the single most important factor in averting maternal deaths.[12] It was linked to an enhanced ability to access existing health care services, including skilled attendants for childbirth.[12] Chile, a paragon for maternal health, reduced its maternal mortality ratio (MMR) by 93.8% between 1957-2007.[12] The variables affecting this decrease included the predictable factors of delivery by skilled attendants, complementary nutrition for pregnant women and their children in the primary care clinics and schools, clean facilities, and fertility control.[12] The factor that was defined particularly important and deemed to have positively enhanced the impact of all the others (for averting death) was the educational level of women. Chile's MMR decreased commensurately with every additional year of maternal level of education between 1957-2007.[12] Maternal level of education is therefore defined a major modulator that has helped Chile to reach one of the safest motherhood echelons in the world.[12] It however also paradoxically contributes to decreased fertility which excessively delays motherhood and increases obstetric risks associated with advanced maternal age.[12]

Bangladesh recorded a significant reduction in its maternal death ratio from 574 to 194 per 100 000 live births between 1990-2010 in both urban and rural communities.[13] This achievement was largely attributed to increased utilization of health care services as a result of a revolutionary 80% increase in level of education for women aged 15-24 years.[13] Female literacy in rural Bangladesh exceeds male literacy. Increased female education has, in turn, led to reduced fertility in Banladeh.[13] A Lancet research also highlighted the key role of maternal level of education in saving lives. The Lancet study pointed particularly to the increased average years of schooling for women aged 25-44 years in sub-Saharan Africa that increased from 1.5 in 1980 to 4.4 in 2008.[14] Conclusively, the Lancet research posited that formal education was indispensable in the quest for giving women independence, autonomy and tools they need to make use of available obstetric care services.[14] Findings of this study indicating maternal deaths mostly occurred in advanced pregnancy remain inconclusive as the study was health facility-based. Secondly, maternal deaths occurring in early pregnancy together with community deaths may be defined by a larger degree of underreporting.

As the maternal level of education increases and fertility drops, exposure to maternal health (obstetric) complications diminishes commensurately with the number of pregnancies and births.[9] This is supported by findings of this study indicating that women of higher levels of education were largely uni- or biparous and urban residents.[9, 15] Extant evidence consistently show profound effects of formal education on improved utilization of health services. Findings of global analyses of predictors of maternal deaths also strongly suggest that low female level of education significantly predicts maternal deaths.[15] Universal basic education reduces poverty and contributes to individual economic growth as it enhances opportunities for improved Socio-economic status.[8] The relationship between education and maternal health, (identified in this study and widely established in extant literature), is consistent with the interdependence or interrelatedness of human rights.[8] An individual's ability to read, write and calculate is acknowledged as a human right (among other rights) to be prioritized by duty bearers.[8] An example of the indivisibility and interdependence of human rights includes the fact that the right to health is inextricably linked to an individual's right to formal education.[8] Maternal level of education, (identified among the most important factors for averting maternal deaths), is also defined a factor that enhances the positive effects of all other preventive factors.[16]

Equity requires that male and female interests are treated without discrimination and that materially different interests are treated in ways that adequately respect the differences. Female literacy in Ghana

(71.4%) is lower than male literacy (82%) according to 2015 estimates.[17] Failures to accommodate biological differences between the sexes, (demonstrated in high maternal death rates mostly preventable through cost-effective interventions), can be ameliorated through commitment to the HRBA.[18] Strategic investments to improve quality of life through increased female access to formal education may have the greatest impact on maternal death reduction.[19] In Ghana, about 20% of women aged 15-49 have no exposure to formal education.[19] Sixteen percent have a primary, 40% have a JHS and 18% of women have SHS level of education.[20] Only 8% of women have > SHS level of education.[20] This study also notably pointed to a particularly high maternal death burden among women of JHS level of education. This is conceivably explained by the fact that the JHS level of education, (as indicated above), constitutes the most prevalent level of education attained by women in Ghana. Women in urban areas are more likely to be literate (65%), compared to women in rural areas (41%).[20] This is depicted in this study's finding showing that women's rural residence's representation among maternal deaths generally remained higher. The HRBA posits that preventable maternal death represents a violation of the right to life. It emphasizes that the right to decide freely on the number and spacing of one's children and the right to formal education have a bearing on maternal death.[2, 21]

Conclusion

The HRBA to social development aims to achieve positive transformation of power relations among duty bearers and rights holders through strengthening capacities of duty bearers while empowering rights holders. While recognizing formal education as an inalienable human right important for averting adverse maternal health outcomes, this study identified the following. The mean maternal age was generally higher among women with ≤ JHS level of education. Mean gestational age at death varied insignificantly across all levels of education. Women with JHS level of education accounted the highest proportion of maternal deaths while deaths among women with ≥ SHS level of education remained low. This pattern remained constant among urban and rural residents. Deaths were generally higher among rural residents and comparatively lower among both married and single women with ≥ SHS level of education. Deaths among women with informal occupations decreased with increasing level of education. Maternal deaths among women of ≤ JHS level of education occurred in higher proportions among women with spouses or partners of similar levels of education. Blood transfusions were documented in higher proportions among women unexposed to formal education. They also accounted for higher proportions of deaths among women who did not attend ANC during pregnancy. Grand multiparous women accounted for the peak maternal deaths among women unexposed to formal education and women with primary level of education. Deaths mostly occurred in advanced pregnancy. Women unexposed to formal education were most prevalent among deaths following SVD while deaths following CS mostly occurred among women with tertiary level of education.

Recommendations

All socio-economic, socio-cultural, geographical or religious barriers to accessing formal education to ≥ SHS level, (i.e. ≥ 12 years of education), among females should be progressively modeled as research priorities and targeted for elimination within the context of a HRBA. The impact of Ghana's national free SHS policy, (rolled out in September, 2017 to universally increase access to SHS education), on maternal and general public population health should be prioritized for research after about ≥ 10 years post implementation.[22] The HRBA to assessment of progress towards attainment of all health objectives should remain of national essence. Commitment to and understanding of the HRBA to service delivery at all levels of health care will enhance service provider capacity for recognition of human rights in all aspects of health programming.

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