AN ASSESSMENT OF MATERNAL MORTALITY IN PAPUA NEW GUINEA: AN EXPLANATORY SEQUENTIAL MIXED METHODS APPROACH

By

Jennifer Litau[1], Hilda Tanimia[2], Ellie Korave[3], Poisy Kae[4], Lucy Kalep[5], Kenny Abau[6], McKenzie Maviso[7], Kia-Henry Nem[8], Anne Litau[9]

Abstract

Research into the serious manifestation of maternal mortality in Papua New Guinea is essential for decisive knowledge production, timely and accurate generation of data, and for informing practical intervention. Explanatory sequential mixed methods approach employed first involved SPSS analyses of Gulf Provincial Hospital's obstetric data revealing high rates of home deliveries by mothers. Interviews in high incidence communities provided explanations, meanings and mortality experiences.

INTRODUCTION

An assessment of the maternal mortality experience of Papua New Guinea (PNG) is for essential knowledge production, timely and accurate generation of data, and for informing practical intervention efforts without which those most vulnerable will remain invisible and neglected. Fundamentally, a clear understanding of the causes of maternal mortality is required to address this key indicator of international development which many less economically developing countries struggle for its substantial reduction (Zureick-Brown *et al,* 2013). From UNFPA's website, indigenous women and adolescent girls such as those in PNG are depicted as suffering more from maternal mortality than others but who remain invisible and the problem unaddressed from a lack of timely and accuracy of data. United Nation's MDG Goal 5 to improve maternal health from 1990 to 2015 involved the resolution of world countries for the substantial reduction by three quarters the world's maternal mortality ratio (MMR). Haupt *et al* (2011) define maternal mortality ratio or rate (MMR) as the number of women who die, including deaths from spontaneous or induced abortions, as a result of complications from pregnancy or childbearing in a given year per 100, 000 live births in that year. This MMR is the obstetric risk of mortality associated with each pregnancy: maternal deaths divided by total live births per 100, 000 lives in a given year (Mola and Kirby, 2013; Haupt *et al* 2011). A true maternal mortality rate would divide the number of maternal deaths by the number of women of childbearing age in the population (Haupt *et al* 2011, Zureick-Brown *et al* 2013). The former definition of MMR is adopted in our study for comparison purposes.

As occurs in PNG, we adopt the maternal mortality definition of WHO: maternal death or mortality is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from an accidental or incidental causes (Zureick-Brown *et al* 2013, Haupt *et al*, 2011, NSO 2009). In circumstances when

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death attribution is inadequate, Zureick-Brown *et al* (2013) recommend the "pregnancy-related death" concept is employed in lieu of maternal mortality. This concept is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death. We classify mmaternal deaths by their causes: direct obstetric, indirect obstetric causes due to other diseases or conditions that have been aggravated by the physiological effects of pregnancy and non-obstetric causes. For the purposes of this research, direct obstetric deaths result from obstetric causes during antenatal, intrapartum, postnatal or postpartum periods or from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above. Indirect obstetric cause refer to diseases and conditions aggravated by the physiological conditions of pregnancy. In our research, indirect non-obstetric maternal mortality refer to causes or barriers identified (National Department of Health, 2009) as including broad areas of geography, development service deprivation, structural, financial, environment, socio-culture, and the weak national services or health delivery system preventing maternal access to ANC, supervised child delivery, and postnatal maternal and infant care.

The structure of the paper is as follows. It begins with *Introduction*, It also provides rationales for selecting Gulf Province as a case study. The next sections of this paper are the *Background* consisting of a brief overview of the importance of maternal mortality research about the world and Papua New Guinea for relevant maternal health knowledge production, timely and accuracy of data and for informing practical intervention efforts. The *purpose, methods, data source, results/findings, and discussion/conclusion.*

BACKGROUND

Research tradition on maternal mortality has only occurred since the 1980s and even to date, issues of data prevail and challenge efforts of knowledge production and subsequent interventions. Zureick-Brown *et a*l (2013) provide a chronological review of maternal mortality research from the 1980s when researchers first highlighted complications of pregnancy and childbirth and the inadequacy of addressing these. The 1987 Safe Motherhood Conference in Nairobi followed by the 1990 World Summit for Children, the 1994 International Conference on Population and Development, and the 1995 Fourth World Conference on Women are acknowledged as ultimately responsible for inspiring earlier research and practical campaign contributions to the reduction of maternal mortality. In its world brief at the end of the MDGs, United Nations (2015) indicated that strategic achievements, although falling short of the planned three quarter reduction in MMR, resulted in a reduction of the global MMR to 216, achievement of 77% supervised births by trained health personnel from 2000-2016, and an adolescent 15-19 year old birth rate of 55 per 1,000. The introduction of the United Nation's latest world's development agenda post-2015 of the Sustainable Development Goals (SDGs) launched in 2016, maternal health becomes directly invisible. In none of the current 17 SDGs is improvement in maternal health visible (Wysokińska, 2017). However, as Kia-Henry Nema, Team leader for UNDP Papua New Guinea's Population, SDGs and Aid Effectives Program and our own co-researcher in this project encourages academics in PNG to contribute towards the realisation of this universal agenda with collaborative research, capacity building initiatives, cross-cultural exchanges, and facilitation of debate and discussion opportunities. It is envisaged that this integrated and multiple stakeholder participation and partnership drive for elimination of poverty and reduction of inequality that maternal mortality and health issues will be eliminated. Wysokińska (2017) and Sachs (2012) emphasize the integration of economic and ecological or environmental sustainability with social inclusion to "reach the

furthest behind first" that "no one will be left behind," to end poverty, protect the planet and ensure prosperity for all. Sachs (2012) has argued that the greatest constraint is still for successful outcomes of SDGs are timely and accuracy of data for measuring progress of countries.

This occurred partly because of improvements in reduction of maternal deaths during the MDG era (United Nations, 2015). United Nations indicated that the burden of maternal mortality shifted from East Asia to Sub-Saharan Africa. However, countries experiencing the heaviest burden are challenged to produce timely and accurate data on maternal mortality that would indicate their progress in reducing maternal mortality. Zureick-Brown *et al* (2013) stress data challenges to such countries justifying mathematical modelling and estimations of MMR especially by international organisations.

The timely and accuracy of data highlighted in Sachs (2012) has been critical for indicating progress for maternal mortality intervention and reduction in Papua New Guinea but is still largely incomplete and inadequate (National Statistical Office, 2006). Mola and Kirby (2013) and National Statistical Office (2006) attribute as one cause of this the lack of vital registrations and that 85% of the population of Papua New Guinea reside in rural areas with little or no access to health facilities (Mola & Kirby 2013). National Department of Health (NDoH, 2009) suggests also the inadequacy of research into the multiplicity and complexity of causes of maternal death. NDoH (2009) captures this acknowledgement by The Ministerial Task Force on Maternal Health in Papua New Guinea that more than three quarters of maternal deaths in PNG were unnecessary and preventable. However, in the absence of adequate and timely data, including knowledge about mitigating factors ranging from geography or environmental to cultural and weak national service and health delivery systems and risks associated with high maternal parity and gravida, intervention is challenged (NDoH, 2009). MDG goal 5 was adopted in 2010 as Key Result Area (KRA) 5 "Improve maternal health." in Papua New Guinea's current National Health Department's (NDoH, 2010) National Health Plan (NHP) 2000-2020 elevating maternal health as a national development priority. The Plan's objectives prescribed for improving and achieving maternal health with an inevitable reduction in maternal mortality are an increase in family planning coverage, an increase capacity of health sector to provide safe and supervised deliveries, an improvement of access to emergency obstetric care, and improvements in sexual and reproductive health for adolescents.

Among many other factors, interventions against high maternal mortality in Papua New Guinea are hampered because of a lack of knowledge and inconsistent data for calculating correctly the MMR. As case in point, we calculated from Mola and Kirby's (2013), 2009 data from the NDoH information systems of facility-based supervised delivery in Gulf Province and their 2010 data from Gulf provincial health facilities data two extremely high maternal mortality ratios of an estimated 1,788 maternal deaths per 100, 000 live supervised births in 2009 and estimated 1,770 maternal deaths per 100, 000 live births in 2010. Each of these MMR for Gulf were about four times more than Mola and Kirby's 2010 estimated PNG's MMR of 457 maternal deaths per 100,000 live births in 2010 and all previous MMR estimates on PNG. International bodies estimated MMRs of 930 for 1980 and 230 for 2010, while National Statistical Officer estimated 370 in 1996 and 733 in 2006 (Mola & Kirby 2013, NSO 2006). The MMR scenario just described gets blinking red lights for Gulf Province and rural parts of the country that calls for an urgent attention and address of the situation. Women at higher risk of mortality were identified in Papua New Guinea's Demographic and Health Survey of 4,111 women in 2006 to be mainly from rural areas, mid-thirties or older, with none or little education all had low attendance at ANC, a

supervised delivery, a health facility delivery, with common home deliveries (National Statistical Office, 2006). Nearly 15 years have lapsed since that survey and the most recent survey results of 2012 are yet to be disseminated.

We were alarmed by these extremely high 2009 and 2010 Gulf MMRs but we lacked clear understanding of the reality of rural Gulf's situation. We were concerned as well of a gross under-report of rural maternal deaths, rural obstetric and non-obstetric causes, and gross inadequacy of official records by health authorities and Kerema General Hospital (KGH). This necessitated that selection of mixed methods approach to mix and combine both quantitative and qualitative viewpoints, methods, instruments, data and analyses in this one study. Our insufficient knowledge about the experiences of community complemented by our access to Kerema General Hospital (KGH) records inspired our choice of the explanatory sequential methods in which quantitative data was first explored and for explanations of the patterns, qualitative data was utilised (Schoonenboom & Johnson, 2017).

Thus, this assessment of maternal mortality in the Gulf Province utilising first quantitative obstetric data from KGH was followed with fieldwork community people's narratives to address our research questions. The research questions are (1) What are the direct obstetric causes of maternal mortality in Gulf Province?; (2) What are the indirect obstetric causes of maternal mortality in Gulf Province; (3) What are the non-obstetric causes of maternal mortality in Gulf Province?; and (4) Explain the linkage between obstetric and non-obstetric causes of maternal mortality in Gulf Province? First step in this research was to access available KGH's records, collate, and analyse with SPSS the July 2006-April 2011 obstetric admissions data and 2012-2014 obstetric data of the Kerema General Hospital (KGH). High proportions of home deliveries or birth (35% out of 587 admissions during July 2006-April 2011) were recorded as BBA or *Born Before Arrival* incidences from several villages especially within the Kerema District dictated and isolated sites chosen for qualitative data collection. Within the Kerema District villages of Meii 1 and 2, Sori 1, Mamuro, Siviri, and Karama, village meetings and verbal autopsies of maternal deaths were conducted into direct and indirect obstetric and non-obstetric causes of these maternal deaths and obstacles to safe motherhood.

PURPOSE

To identify and describe the major direct obstetric, indirect obstetric and indirect non obstetric and map the linkages between them with regard to causes of maternal mortality in the Gulf Province of Papua New Guinea.

METHODS

Our concerns about immediate obstetric, indirect obstetric and indirect non-obstetric causes of maternal mortality on the one hand and insufficient data about Gulf Province necessitate the selection of a mixed methods approach for this research.

> Mixed methods research is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e. g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration. (Schoonenboom and Johnson 2017, 108)

Mixed methods has emerged alongside qualitative and quantitative approaches as an important tool for health service researchers (Zhang and Creswell, 2013). We chose Explanatory Sequential Mixed Methods Approach to accommodate for the lack of knowledge about the community situation but having had prior access to Kerema General Hospital's obstetric admissions data. The quantitative component of the study was dominant, indicated in caps and qualitative component was minor: [QUAN ➡ qual] (Shoonenboom & Johnson, 2017).

DATA SOURCE AND SITE SELECTION

Quantitative data was obtained through fieldwork in 2017 at the Kerema General Hospital and involved accessing available Kerema General Hospital's Obstetric Admissions' Registries and typing all their entries into excel for SPSS analysis of descriptive statistics mainly frequencies to summarize the final diagnoses of admissions. Due to the inconsistency in maintaining hospital records and too few sightings of maternal mortality neither at KGH, nor at the Provincial Health Department nor of Gulf with the National Department of Health, we decided to use data of Admissions records of the years 2006 to July 2011. Other limitations of our study design were the absence of adequate knowledge about reality in Gulf led to an ambitious design, missing records at KGH prevented trend analyses, missing information of maternal mortality and their registers at the hospital, and the fieldwork period was limited hence only a few high BBA incidence villages were selected rather than more.

Preliminary SPSS analyses of final obstetrical admission diagnoses at KGH between 2006 and 2011 for the 587 admissions yielded two important results. Firstly, 35% of admissions were of mothers who experienced a child birth or whose child was *Born Before Arrival* at this hospital. This is an indirect obstetric cause. Secondly, 35% comprised indirect obstetric causes including morbidity and lifestyle-related sicknesses. The next step involved consultation into the selection of some of the high BBA incidence rural villages at where qualitative fieldwork were undertaken. Ironically, high BBA incidence villages were within easy access to time-distance travel to the Kerema General Hospital. Siviri was a 10-15 minutes' walk to the hospital or a few minutes car ride. The villages of Meii 1 and Meii 2 were a 30 minutes ride in a motorised boat to Kerema and a 5-10 minutes' walk to the hospital or a few minutes car ride. Sori 1 was an hour's river ride in a motorised boat when transport was available or alternatively a six-hour's canoe paddle through a winding river systems to Kerema and 5-10 minutes' walk to the hospital. Mamuro was a one hour river ride in a motorised boat to Kerema and a 5-10 minutes' walk to the hospital. Karama was an hour's vehicle ride to Kerema hospital. However, each of these villages were represented as high BBA incidence communities. Our curiosity was directed at discovering what obstacles prevented their timely access to the hospital and also whether any other previously unaccounted BBA cases had resulted in maternal deaths.

Qualitative data was undertaken in January 2018 for this purpose to obtain through fieldwork in high BBA incidence communities their explanations for high BBA and from verbal autopsies to determine previous maternal mortality incidences. During this qualitative fieldwork, health personnel and local people's narratives and explanations of these phenomenon were collected. This was undertaken through village meetings, women's meetings, and individual interviews. Verbal autopsies asking about the death, its direct and

indirect cause, and explanations were also enquired of individuals and the communities. These are oral history communities and also has Carr (2010) had suggested the stories of research participants require our attention because they are windows onto indigenous narratives of development and our placement in those narratives.

RESULTS

As the bulk of data are still in analysis stage, only a few key preliminary results will be presented to generally address the research questions and explain the high rates of BBAs. Fundamentally, BBAs were common and frequently resulted in maternal deaths only known in the community but predominantly unreported to authorities. Overall findings are reported in these next three points. Firstly, the two most direct obstetric causes of maternal deaths derived from narratives and from verbal autopsies were (1)"heavy bleeding" or postpartum haemorrhage, and (2) "bilum i no kam" or retained placenta. Secondly, what has been interesting to note about indirect obstetric causes is that during antepartum stage, sickness and related conditions will arrest attention and action of the immediate family especially the husband to facilitate transportation of mother to a health facility or personnel or care. This explains the other 35% of final diagnoses from obstetric admissions at Kerema General Hospital. During the intrapartum or labour and postpartum stages, unmanaged illness contributed to higher risk for mortality and pregnancy-related complications arose for mothers resulting in the death of one too many. Thirdly, indirect non-obstetric causes operated at different scales and spaces ranging from household, community, provincial and national and encompassing broader geographical, environmental, cultural, educational, and household development deprivations to list some selected ones. BBAs can be explained from a number of perspectives mainly of non-obstetric nature that affected the entire pregnancy through to the postnatal stage. These are itemised in the next eight points below.

Firstly, at the family and household level, pregnancy and childbirth are a family affair and pregnant mothers in these villages prefer to deliver their newborns at home off course with the supervision, traditionally, of a female relation especially of a mother or an aunt. At Meii 1 and 2, the NGO Save the Children Fund had engaged two Kerema General Hospital midwives to train Village Health Volunteers (VHVs) in performing and these assisted pregnant mothers caught up with village deliveries. In the other villages, deliveries by pregnant mothers caught in this situation were assisted by female relations. In Mamuro, underneath the house on the ground was prepared for mothers to deliver newborns. However, any of these could go wrong in the event of an obstetric emergency.

Secondly, the situation described above was aggravated with little or no formal maternal education hence high incidences of maternal illiteracy. In such as state, a pregnant mother with no knowledge of the creole or English experienced shame and reluctance in seeking ANC, supervised delivery, and choosing a health facility as a preferred place for the delivery of her newborn. Some such mothers begin their journey to Kerema General Hospital upon first signs of labour but end up as a BBA case. Sori 1 village lost 8 mothers in 2017 due to complications of postpartum haemorrhage during intrapartum and

postpartum stages. This occurred because of the slow canoe ride. Each of these mothers were being transported in a canoe to make the 6 hour canoe trip from upland to Kerema Bay to attend Kerema General Hospital. The same number had died in Karama, a road access village but with poor access to transportation from similar causes.

Thirdly, timely access by rural low income river and coastal households of the motorised boat hire rates including of K200 (US$60 estimate) for Meii 1 and 2, Sori 1 and Mamuro motorised boat fares. Boat owners often demand a down payment of this fare before any boat trip is undertaken from especially Sori or Mamuro villages to Kerema General Hospital. Family or mother endures great risks to deliver her newborn at home and safety, hygiene and cleanliness might were compromised.

Fourth, insufficient rural health facilities and female nurses or community health workers prevented women from sourcing antenatal care and timely referrals to the hospital thus contributing to high BBAs as well. Pregnancy and childbirth are taboo to men of this province. In Meii 1& 2 villages, where an aid post was about a 15 minutes' walk, most pregnant mothers had attended ANC nor visited it because the nurse was a male. The lack of a health facility existed in the other fieldwork villages. The gravity of these deterrents with maternal death risk and vulnerability is signalled about the 89 health facilities operating in the province in 2016 with three quarters of them staffed by a male nurse or community health worker.

Fifth, timely inaccessibility to vehicle or motorised transportation during labour or a BBA case, or in an obstetric emergency has resulted ultimately in death. Underscoring this serious issue is the gender, power and positionality issues. No women own any of the motorised boats or any form of transportation in the villages of our field study. It is small village business men who owned boats so they will provide transportation of a pregnant mother only upon full payment of the fee or at their convenience. In the villages visited, boat owners even demanded a full boat fare payment before departure.

Seventh, environmental factors including vast terrain, interspersed with endless meandering rivers and tributaries, rough seas, and road-unreached isolated communities tyrannize the province, and its communities including especially pregnant mothers. Even when all the factors highlighted above are provided, nature has conquered in certain situations. For example, Sori 1 village or families (e.g. Meii 1 & 2 and Mamuro) or a husband (Meii 1) have had the transport fee and accessed a motorised boat but environmental factors especially including low tide for coastal Meii 1 and low river water levels for Mamuro inhibited making the timely trip to hospital/.

Eight, geographical constraints preventing the establishment of infrastructural and development services including location of health facilities in highly populated areas of the province the Gulf province are ultimately responsible for the inability to conquer the time-distance geographical factor because acute delays and complications experienced in labour or postpartum have resulted in deaths and high BBAs.

CONCLUSION

The key obstetric findings from village women's narratives in the selected villages visit are the pregnancy related deaths are caused from BBA-related complications of postpartum haemorrhage and retained placenta complications. To determine that cause of BBAs experienced during 2006-2011 period which will contribute to BBA statistics. These explanations of the causes of high rates of BBA and BBA-related maternal deaths reflect the country's experience of 2006 and since independence. Overcoming geographical and environmental obstacles is a lifetime challenge for a province with rugged terrain and hundreds of meandering and dangerous tributaries obstructing travel. High illiteracy and inaccessibility to health facilities are service delivery issues and can be rectified. Cultural and gender issues mentioned can also be addressed through increased education and safe motherhood campaigns. Timely navigation of distance in the context of geography and all other factors poses the greatest challenge that culminate in the realisation that to fully and competently address BBA-related deaths will require decentralisation of ANC, birthing and postnatal services and facilities to the level of communities. Non-obstetric factors primarily contribute to high rates of BBA and mitigate risks and maternal deaths for mothers.

Little research highlighted in literature about maternal health and mortality applies to Gulf Province and has contributed to an inadequate comprehension of the issues and or, provided relevant information for intervention. Data is scanty and limited and hospital and Health Department data is scanty and inconsistent despite systems and structures in place to report and record. While policy such as the current National Health Plan does for addressing both maternal health and mortality exists, severe shortfall exists with practical interventions and inconsistency in monitoring and evaluation or programs in place. Failure occurs with registering maternal deaths on the simple maternal mortality register provided to hospitals and health care facilities. Most rural deaths are unknown and unrecorded therefore are invisible. We have conducted two debriefs with Kerema General Hospital management and Obstetrics and Gynaecology Unit Staff about the important role in planning and intervention of regular and correct record keeping. We have been assured for more due diligence in this area. We have also communicated about the urgency of improving communication between rural health facilities and air, sea, river and road ambulances dedicated to medivacs as is done by the Oil Search Company in the Kikori District west of the province. The next stage of this project is to compile a handbook for safe motherhood and instructions for Emergency Obstetric Care for rural communities.

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[1]Senior Lecturer, School of Humanities, Education and Theology, Pacific Adventist University, Private Mail Bag, Boroko, Port Moresby, Papua New Guinea. Email: Jennifer.Litau@pau.ac.pg.

[2]Lecturer, Obstetrics and Gynaecology Dept, Medical Faculty, University of Papua New Guinea, Port Moresby, Papua New Guinea. Email: H_Tanimia@yahoo.com

[3] Midwifery Tutor, School of Health Sciences, Pacific Adventist University, Private Mail Bag, Boroko, National Capital District, Papua New Guinea. Email: Ellie.Korave@pau.ac.pg.

[4]Teacher, Kerema High School, Gulf Province, Papua New Guinea. Email: poisykae@gmail.com

[5] Senior Midwife, Kerema General Hospital, Kerema, Gulf Province. Papua New Guinea, Email: lucillekalep@gmail.com

[6] Senior International Operating Officer, Air Transport Division, Department of Transport, Enga House 1, Jackson's Parade, Port Moresby, Papua New Guinea. Email: kabau@transport.gov.pg

[7]ADRA, Papua New Guinea Union Mission, Lae, Papua New Guinea. Email: meninmaternitycare@gmail.com.

[8]Team Leader, Population, SDGs and AID effectiveness, UNDP, Port Moresby, Papua New Guinea. Email: kia-henry.nema@undp.org.

[9]Nursing Officer, Kambubu Adventist Secondary School, Kokopo, East New Britain, Papua New Guinea. Email: anne.litau@gmail.com.