



Trends and Epidemiological Characteristics of Maternal Deaths in Diwania Province-Iraq 2016-2020

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Abstract

This study conducted to determine trends and epidemiological characteristics of maternal death in Diwania province-Iraq 2016-2020..

Maternal mortality is one of the most sensitive indicators of the quality of health care in each country. In 2020, the global maternal mortality ratio was 152 deaths per 100,000 live births

Iraq maternal mortality ratio (MMR) was 291/100,000 live births in 1999 according to Iraqi Maternal Mortality Survey (IMMS). In 2006-2007 the figure was 84 per 100, 000 live birth by world health organization WHO, adjusted to 74 by UNICEF in 2012 and finally to 36 in 2015.

Methods:

Review from surveillance data series for the period of 2016-2020.

Results:

The study identified 83 maternal deaths MD during the period 2016-2020 with 180,500 total live birth.

The MMR were 47, 43, 36, 39, and 44 per 100.000 live births during 2016-2020 respectively.

The leading causes of death were thrombo-embolic events 38(46%) , hemorrhage 20(24%), 9 (11%)hypertensive and cardiac diseases, septicemia 4 (5%) , obstructed labour 6 (7%) and 6 (7%) other causes.

Out of 83 death, there were 66 (80%) gestational age more than 20 weeks, 66 (80%) the gravity was less than 4.

The study showed that 64(77of the dead women were from rural areas.

Conclusion:

This review demonstrates the characteristic of maternal deaths predominance among women having no ANC , pre-existing risk factors and gravida less than 4.

The maternal death trend reveals high in women with low socio-economic status, low education and mostly of rural areas.

Keywords: maternal death, maternal mortality, Diwania

الانماط والخصائص الوبائية لوفيات الامهات في محافظة الديوانية للسنوات 2016-2020

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الخلاصة

تهدف الدراسة معرفة الانماط والخصائص الوبائية لوفيات الامهات في محافظة الديوانية للسنوات 2016-2020 .

تعد الوفيات الامهات من أكثر المؤشرات حساسية لجودة الرعاية الصحية في كل بلد. في عام 2020 ، بلغ معدل وفيات الأمهات العالمي 152 حالة وفاة لكل 100 ألف ولادة حية

بلغ معدل وفيات الأمهات في العراق (291) (MMR) لكل 100,000 ولادة حية في عام 1999 حسب

انتساب الباحثين

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¹ المؤلف المراسل

مسح وفيات الأمهات العراقي (IMMS). في 2006-2007 كان الرقم 84 لكل 100000 ولادة حية من قبل منظمة الصحة العالمية WHO ، وعدلت إلى 74 من قبل اليونسيف في عام 2012 وأخيراً إلى 36 في عام 2015.

الطرق :

مراجعة من سلسلة بيانات المراقبة للفترة 2016-2020.

النتائج:

حددت الدراسة 83 حالة وفاة للأمهات خلال الفترة 2016-2020 بإجمالي 180,500 ولادة حية. بلغ معدل وفيات الأمهات 47 و 43 و 36 و 39 و 44 لكل 100.000 ولادة حية خلال 2016-2020 على التوالي.

كانت الأسباب الرئيسية للوفاة هي أحداث الانصمام الخثاري 38 (46%) ، والنزيف 20 (24%) ، و 9 (11%) أمراض ارتفاع ضغط الدم والقلب ، وتسمم الدم 4 (5%) ، والولادة المتعسرة 6 (7%) و 6 (7%) أسباب أخرى.

من بين 83 حالة وفاة ، كان هناك 66 (80%) من عمر الحمل أكثر من 20 أسبوعاً ، وكان 66 (80%) أقل من 4.

وأظهرت الدراسة أن 64 (77) من القتلى كانوا من المناطق الريفية.

استنتاج:

توضح هذه المراجعة خاصية غلبة وفيات الأمهات بين النساء اللاتي لا يعانين من عدم وجود عوامل اختطار سابقة وحمل أقل من 4.

يكشف اتجاه وفيات الأمهات عن ارتفاع في النساء ذوات الوضع الاجتماعي والاقتصادي المنخفض ، والتعليم المنخفض ومعظمهم من المناطق الريفية.

الكلمات المفتاحية: وفيات الامهات، معدل وفيات الامهات، الديوانية

معلومات البحث

تاريخ النشر : آذار 2023

Introduction

Childbirth is a natural process, though it has been associated with a number of risks, which may result into the death of the baby, the mother or both. Globally, in 2015 maternal mortality ratio (MMR) was estimated at 216 per 100,000 live births [1]. Recent analysis of the global maternal mortality has indicated that 10.7 million women died due to maternal causes between 1990 and 2015; although there was an overall decreased trend by 43.9% during the period. Despite the overall decline in MMR since 1990, the ratio is 15 times higher in low-income than high-income countries [2]. The maternal mortality ratio in Sub-Saharan Africa stands at 546 per 100,000 live births, accounting for about two thirds of the global maternal deaths [1-2].

Maternal deaths are associated with both direct and indirect obstetric causes. The direct causes, which include hemorrhage, hypertensive disorders,

obstructed labour, and sepsis, are responsible for about three quarters of maternal deaths worldwide [3–7]. On the other hand, indirect causes of maternal death include the effects of pre-existing disorders, such as HIV, malaria, tuberculosis, mental diseases, epilepsy, and diabetes [4,7]. Several factors have been associated with maternal deaths; and they include antenatal care, maternal education [8], age and gravidity [9-10]. For instance, the highest parity-specific maternal mortality ratios have been reported among the grand multiparous women [9]. Education enables access to information and helps empower women and their spouses to make appropriate and prompt decisions during pregnancy [11].

Generally, vital registration is considered to provide accurate and timely estimates of maternal mortality [11, 12]. However, studies have shown that in low-income countries the vital registration

systems capture only a small fraction of deaths occurring in the community [13].

Regarding Iraq, the maternal mortality rate was reduced by half from 291 per 100,000 live births (Iraq children and maternal survey (ICMMS), 1999) [14]. to 193 per 100,000 live births (Iraq Living Condition Survey (ILCS), 2004) [15]., then reduced again to 36 in 2015 (MICS6). [16]

This can be attributed to improved access to, and utilization of, maternal and child health services and achievements in the field of communicable diseases and outbreaks control. The introduction of the Integrated Management of Childhood Illness (IMCI) into primary health care and the implementation of the confidential enquiry of maternal deaths as part of the surveillance system also played a part in the improvement. Yet, Iraq's maternal mortality rate remains the highest in the region, with 84 per 100,000 live births.

According to World Fact Book of the United States Central Intelligence Agency 2013, Iraq ranks 97 in maternal mortality rate (CIA World Fact book, 2013). [17] .[

Diwania: is one of the southern Iraqi province, with 1,234,300 habitants distributed in five public health districts and served by 1 general teaching hospital, one gynecological and pediatrics teaching hospital, 1 pediatric hospital, 4 public general hospitals and 42 primary health care centers (PHCCs), and many private clinics.

Total fertility rate (birth per each woman) 4.6, Growth rate: 3.0, Childbearing age women GBAW: 279,524, Proportion of births was attended by skilled health personnel 91.4% ,

The anti-natal care ANC (4th visit and more): 33%, Total live birth: 36,000/ year

Births inside health facilities: 92%, Total births according birth type normal vaginal delivery NVD: 61.0%. [18]

The main objective of this study was to analyze the trend in the maternal mortality rate in Diwania Province from 2016-2020 years and to identify certain sociodemographical, educational and medical factors that could influence it.

Objective

The main objective of this study was to analyze the trend in the maternal mortality rate in Diwania Province from 2016-2020 years and to identify certain sociodemographical, educational and medical factors that could influence it

Materials and methods

Study design

This was a retrospective cross sectional review conducted between January and April 2021 for all maternal deaths that occurred during the period of (2016-2020) .

Study site:

This study was conducted at 5 public hospitals 2 from centers (Diwania gynecological teaching and Diwania general teaching hospitals, and 3 peripheral general hospitals (Hamza, Shamia and Afaq).

Study population:

The sample included all files of women who underwent childbirth or caesarean section and all deaths occurred in the hospitals.

Sampling method:

All hospitals that provide obstetrics and gynecology services in the province .

Data collection method:

A special form was designed by the research team containing the demographic and health data of the target groups.

Variables:

Demographic characteristics: age, educational status, socio-economic status, and residence

Obstetric characteristics: antenatal care, gestational age, gravity, death status and cause of death.

Variables are related to maternal mortality:

Maternal mortality ratio (MMR)

Socio-economic status:

We considered the family's monthly income as a measure of the economic level

Less than 250,000 Iraqi Dinars per month as low

More than 250,000 Iraqi Dinars - less than 500,000 per month as moderate.

More than 500,000 Iraqi Dinars - per month high moderate.

Educational status:

We considered the educational level on the basis of two categories. They are as follows:

A woman who does not have a primary school degree (illiterate)

A woman with a primary school degree or more (literate)

Maternal deaths causes were classified based on case definition by international classification of diseases ICD-10.

We used world health organization WHO definition of maternal death MD

Maternal death is defined as the death of a woman while pregnant or within 42 days of delivery or termination, 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 accidental and incidental causes. [19]. Direct obstetric deaths (or direct maternal deaths) are those "resulting from obstetric complications of the pregnant state (pregnancy, labour and puerperium), and from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above". Deaths due to obstetric haemorrhage or hypertensive disorders in pregnancy, for example, or those due to complications of anaesthesia or caesarean section are classified as direct maternal deaths. Indirect obstetric deaths (or indirect maternal deaths) are those maternal deaths "resulting from previous existing disease or disease that was developed during pregnancy and not due to direct obstetric causes but were aggravated by the physiologic effects of pregnancy". For example, deaths due to aggravation (by pregnancy) of an existing cardiac or renal disease are considered indirect maternal deaths. [19]

Maternal mortality ratio

The number of maternal deaths per 100,000 live births in a given year and area. [19].

Live birth

Refers to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life - e.g. beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles - whether or not the umbilical cord has been cut or the placenta is attached. Each product of such a birth is considered live born. [19].

Ethical considerations

This study received ethical approval from the Medical Research Committee of the Ministry of Health.

Documents were sought from the Ministry of Health

No individual identifiable information like names of the deceased were extracted from the sources provided, however, all entries were given identification numbers.

The Hospital Director and the Head of the Department of the hospital were informed about the purpose of the study, and approval was obtained for the retrieval of data from case sheets.

The confidentiality of information obtained was assured. Informed consent from the patient to review their case sheets was waived due to retrospective and non-interventional study design.

Data entry and analysis:

The data were entered in a Microsoft Excel sheet and analysis was performed by using SPSS version 24. Descriptive statistics like frequency, percentage, mean and standard deviation were calculated and presented in tables..

The characteristics of the study population and prevalence of maternal death were presented by using percentage and absolute numbers. MMR was calculated as the number of deaths due to maternal causes per 100,000 live births within the period.

Results

The mean maternal age at death was 28,6 years \pm 4.99..

The study identified 83 maternal death MD during the period 2016-2020 with 217,500 total live birth. The MMR were 47, 43, 36, 39 and 44 during 2016-2020 respectively .respectively as shown in Figure (1) as follow:

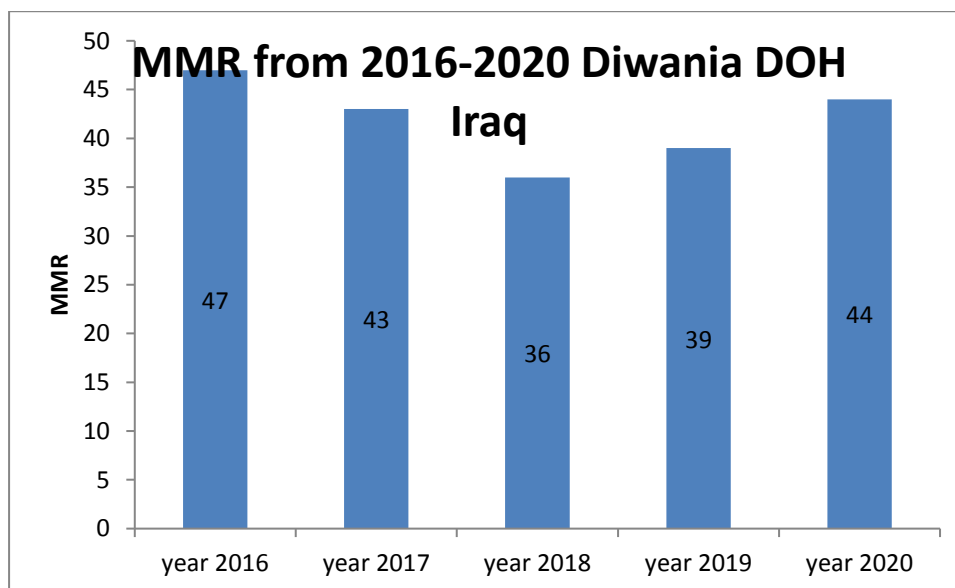


Figure (1) MMR from 2016-2020 Diwania DOH.

The leading causes of death were thrombo-embolic events 38(46%), hemorrhage 20(24%), 9 (11%) hypertensive and cardiac diseases, septicemia 4

(5%), obstructed labour 6 (7%) and 6 (7%) others causes. As shown in (figure2).

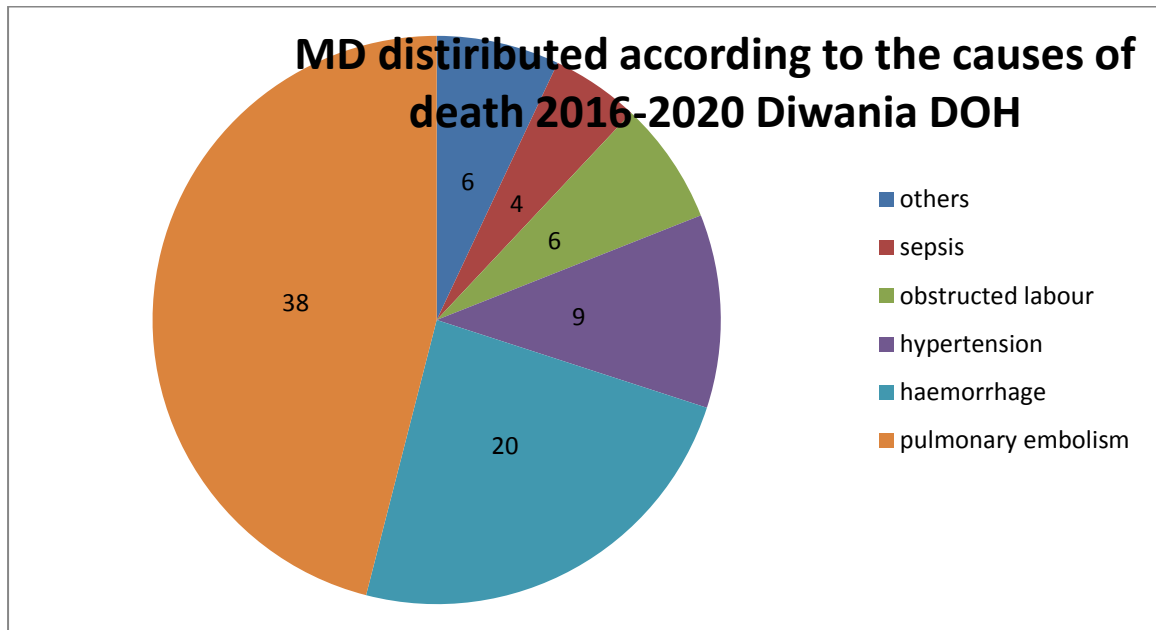


Figure (2) MD distributed according to the cause from 2016-2020 Diwania DOH.

According to the direct and indirect causes of MD, there was 64(55%) are direct causes. As shown in figure (3).

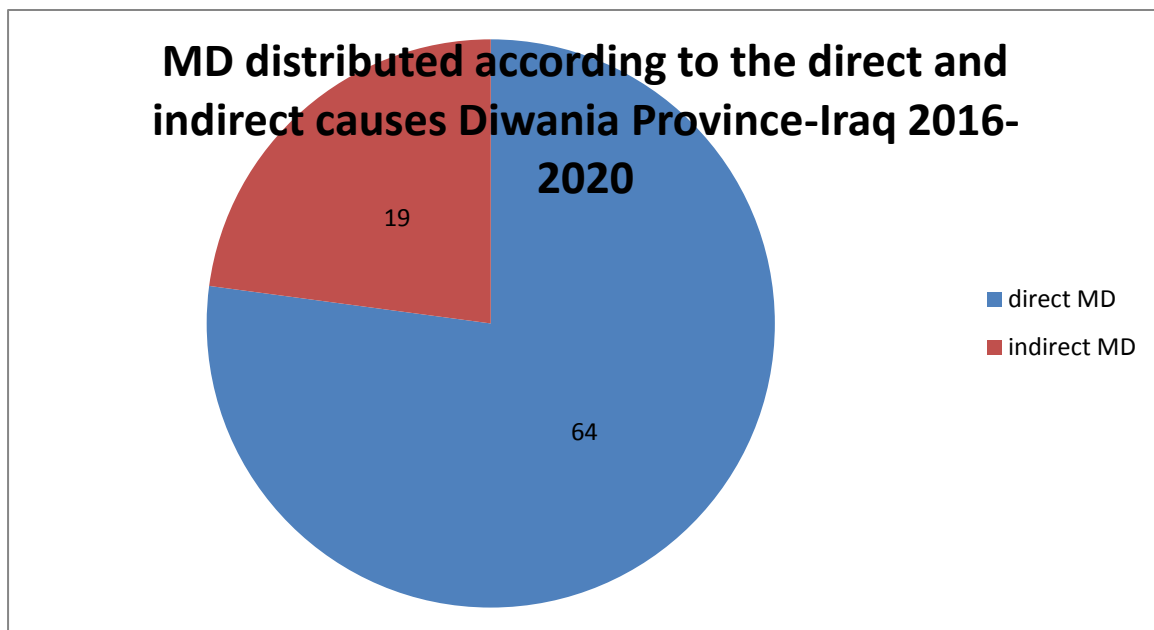


Figure (3) MD distributed according to direct and indirect causes 2016-2020 Diwania DOH..

Out of 83 death, there were 75 (90%) housewife figure (4)

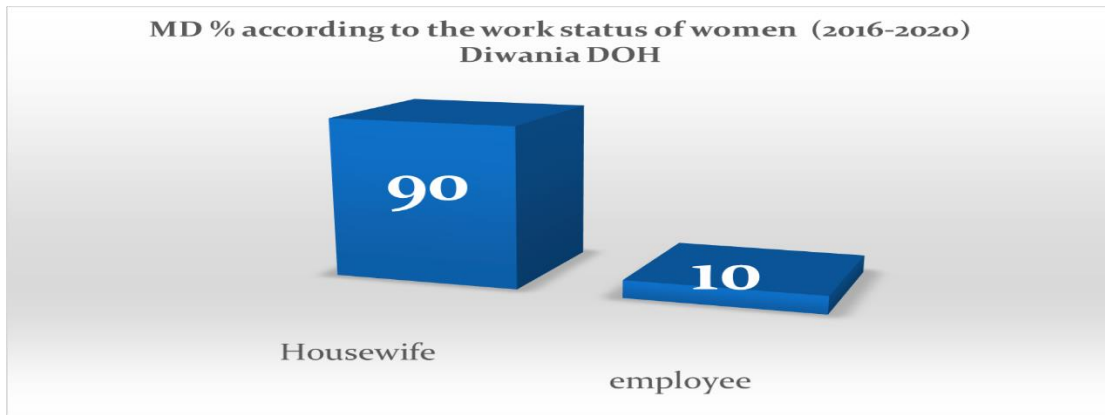


Figure (4) MD distributed according to occupation from 2016-2020 Diwania DOH.

Out of 83 death , there were 66 (80%) gestational age more than 20 weeks (figure 5)

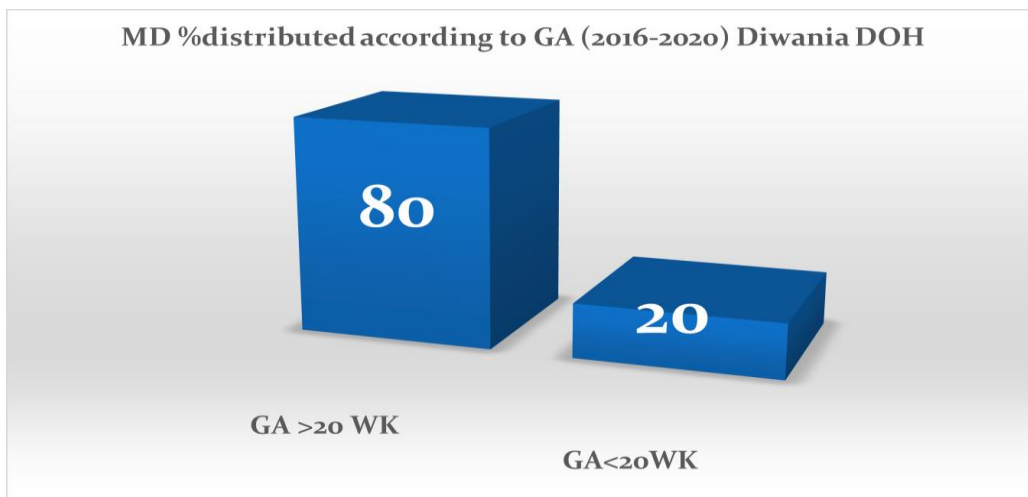


Figure (5) MD distributed according to the gestational age from 2016-2020 Diwania DOH.

Out of 83 death , there were 66 (80%) the gravity was less than 4, (figure 6)

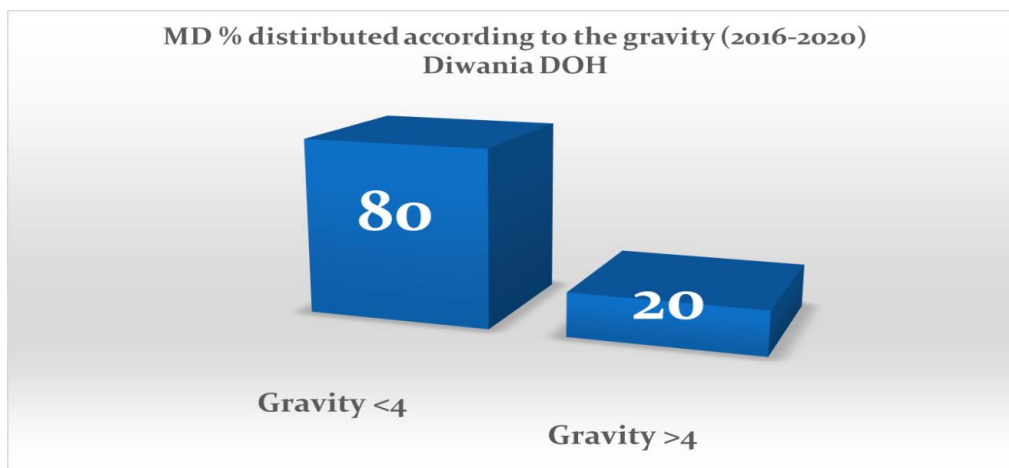


Figure (6) MD distributed according to the gravity from 2016-2020 Diwania DOH.

Out of 83 death, there were 75(90%) had no antenatal care ANC (figure 7)

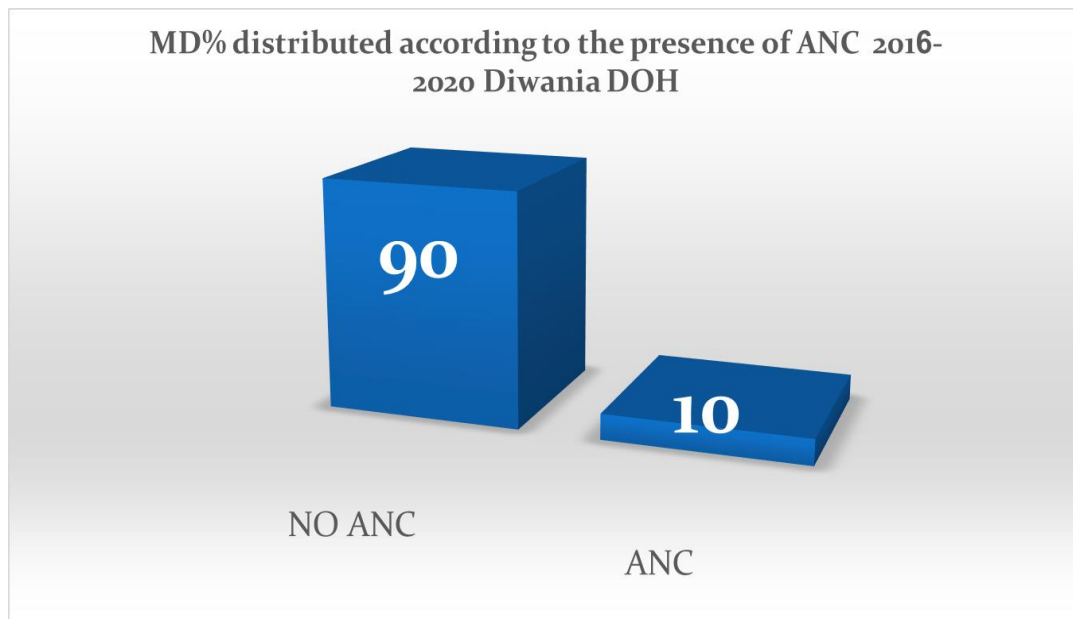


Figure (7) MD distributed according to the gravity of women from 2016-2020 Diwania DOH.

Out of 83 death, there were 66low socio economical class SEC (figure 8)

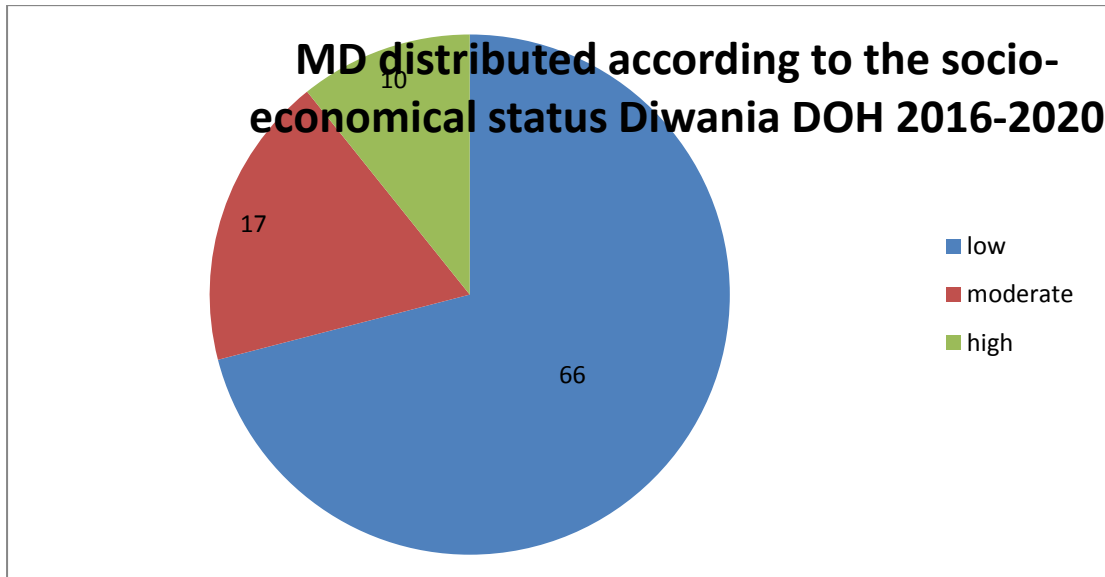


Figure (8) MD distributed according to the SEC of women 2016-2020 Diwania DOH.

Out of 83 death, there were 70 among illiterate (figure 9)

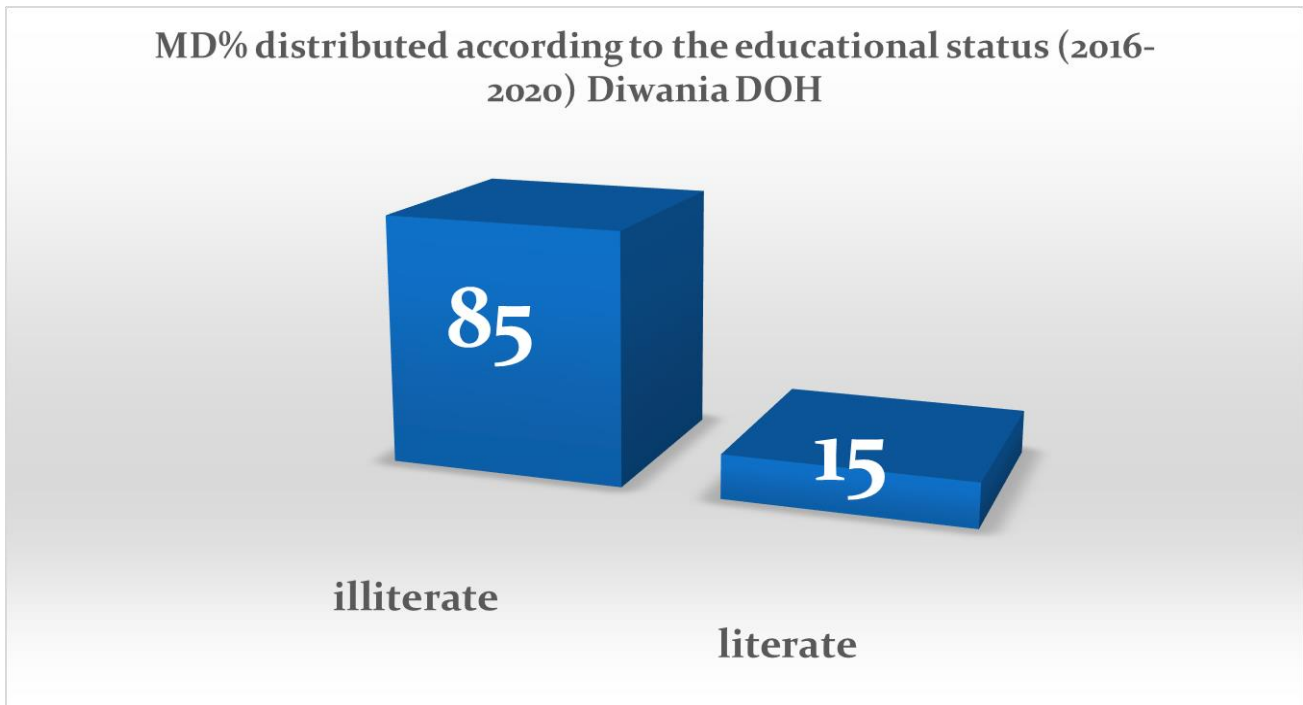


Figure (9) MD distributed according to the educational status of women 2016-2020 Diwania DOH.

Out of 83 death, there were 68 (82%) had pre-existing risk factors (figure 10)

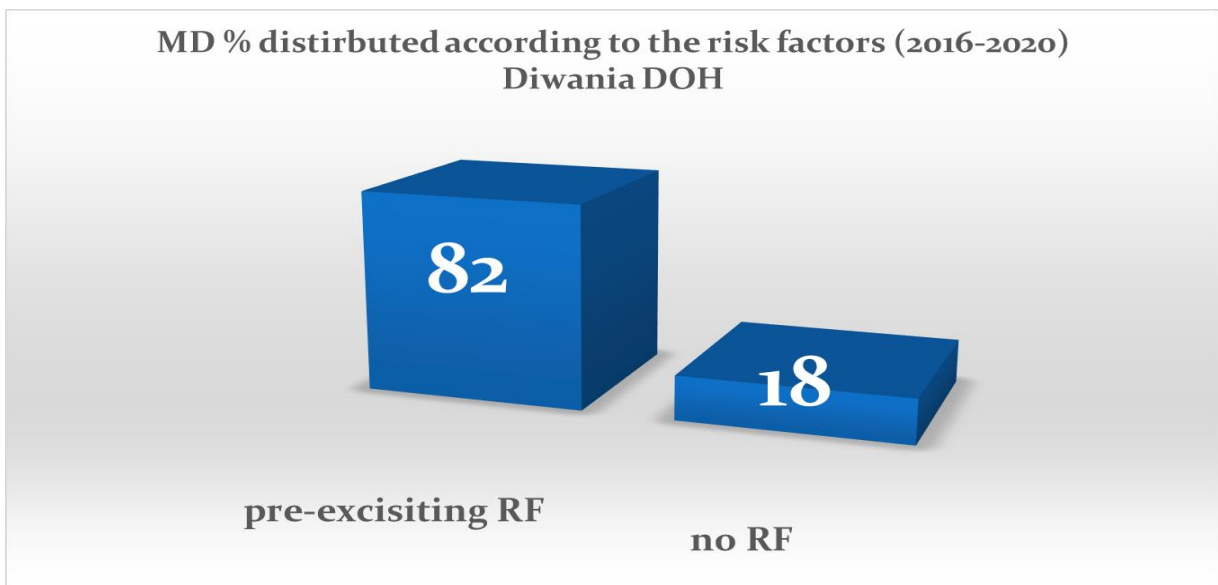


Figure (10) MD distributed according to the pre-existing risk factors 2016-2020 Diwania DOH.

The stage of death were 12 (15%) during pregnancy, 15 (18%) during labour and 56 (67%) during postpartum figure (11)

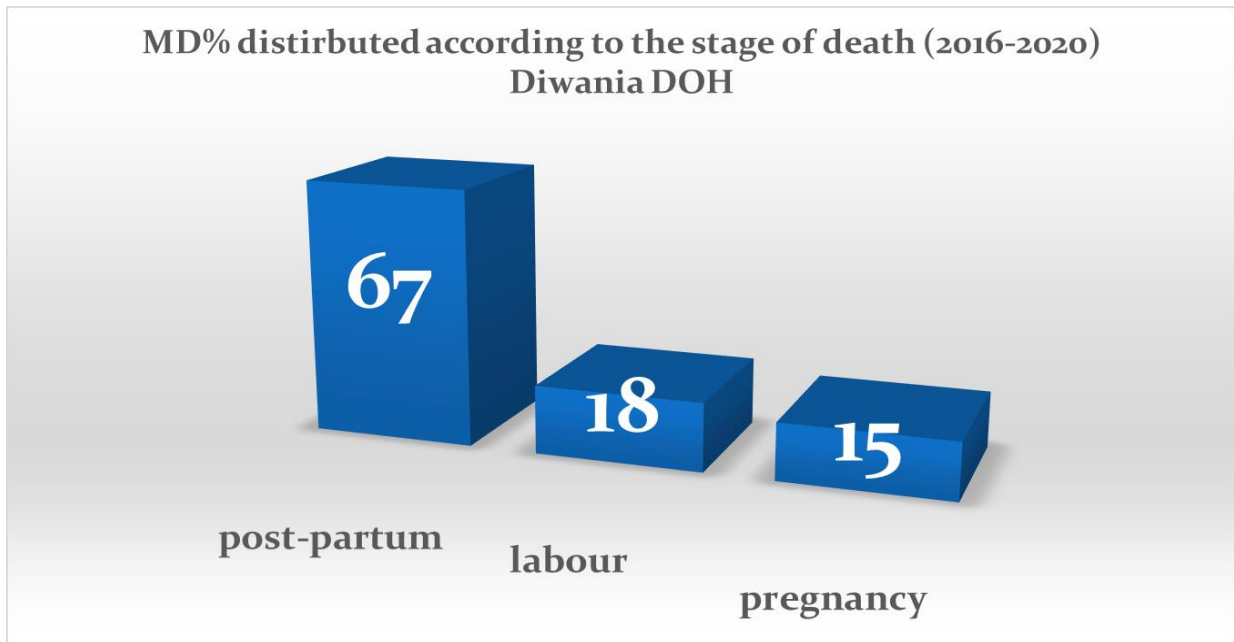


Figure 11 distribution of death according to the stage of death.

The study showed that 64(77%) of the dead women were from rural areas. Figure (12)

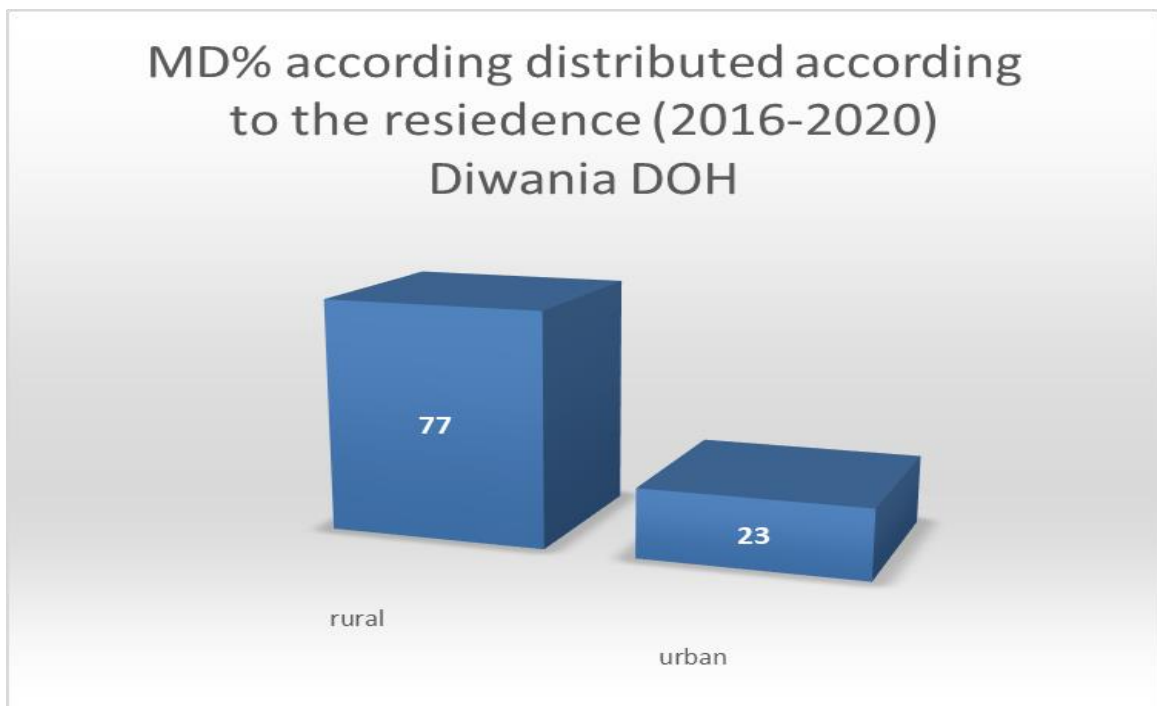


Figure 12 distribution of death according to the residence.

The MD were occurred mainly in Diwania teaching hospital figure (13)

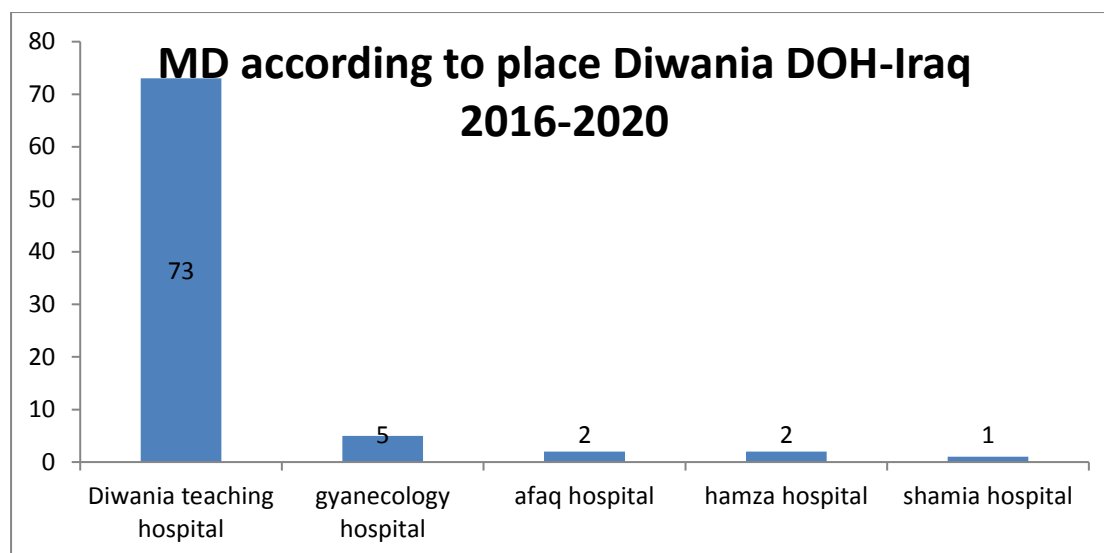


Figure 13 distribution of death according to the place of death.

Discussion

This study utilized hospital statistics to understand the patterns and causes of maternal mortality in Diwania Province. It should be understood that, even in place where mortality rates are high, maternal-related deaths are always rare events hence require attentive measures to be precisely estimated. [20]

In comparison with national figure, the MMR in Diwania Province was still higher.

During the ten years period (2016–2020), the number of maternal deaths remained almost stable from 2006 to 2008 but it was increased gradually in 2020. This pattern is supported by findings that the percentage of facility-based births has risen from 44% (1999) to 63% (2015) [21]

The majority of deaths was in the age category of 20–34 years. Deliveries occurring in facilities were also mostly among women 20–34 years old which could explain for the high proportion of deaths affecting this age category. The findings that maternal deaths affected the young women group have also been reported by other studies in specific hospitals in Tanzania [28–31] and other countries [22–26]

It is important, therefore that reproductive health programmes provide education, family planning services, and both pre- and post-natal care services to reduce mortality among young women.

Most maternal deaths were attributed to direct obstetric causes mainly hemorrhage and sepsis. Similar findings have been reported by other studies elsewhere in Tanzania [27–28,30, 37], Angola [38], Nigeria [39], Bangladesh [40] and Pakistan [41].

Despite this contribution to indirect causes, they have received little attention as most national and international efforts are directed toward direct causes of maternal deaths—focusing on emergency obstetric care [42–44]. It is important that studies to understand these indirect causes of death are carried out to provide evidence to develop appropriate interventions to holistically reduce maternal mortality.

Although grand multiparous women had a higher risk of maternal death from hypertension and haemorrhage, our study revealed that about 95% of maternal deaths occurred among women with parity less than 5. Thus, all women irrespective of parity should be protected from maternal death,

this consists with the study of Nigeria 2007-2019 [45].

Most of the deaths occurred at Diwania teaching hospital, were due to the transfer of all critical cases from the rest of the hospitals to the teaching hospital due to the lack of intensive care units.

This study has some limitations. The information on the causes of death was collected from hospital and was retrospective in nature. We relied on the available documented data from hospital registers and report forms which could be prone to misclassification or misreporting of the causes of death depending on who certifies the death. Moreover, hospital-based data provides estimates of maternal mortality that reflect the experience of a proportion of the population that seeks hospital care during delivery. However, the findings of this study highlight the pattern, trend and causes of maternal deaths, information which is crucial for planning improvement in hospital management. Although the maternal mortality statistics from hospital-based studies are likely to be biased, under-reported and might not give the true picture of what is happening in the community, further future population-based studies is important.

There was not counting births that took place outside hospitals has affected the final maternal mortality ratio so further comprehensive study makes the ratio more accurate.

The study was not able to reveal the real numbers of deaths, because many of these deaths were not recorded as maternal deaths, due to the doctors' lack of commitment to the standard definition of deaths in the death certificate .

This hospital-based study provides little representation of what is happening in the community and may lead to under-reporting. However, this study has been done over 5 years of

duration provides trends of maternal mortality in our population..

Also, this sample may not represent the general population as this is review only statistical section data, medical and surgical data. As this is a descriptive study that lacks a comparison group, it may not provide a causative association for maternal deaths.

Conclusions

Diwania province has high MMR than national figure.

Pre-exciting risk factors, illiteracy, no ANC, presence of, low socio-economic class, gestational age more than 28 weeks, gravity less than 4 and residence were characteristics of maternal death.

The PE and haemorrhage were main killers.

Recommendations

Increase the coverage rate of ANC, establishment in post-partum services (intensive care units), enhancement of transportation of critical cases from peripheries to the center and Strict adherence to scientific indications for caesarean section are crucial to reduce MMR.

References

- [1] Alkema L, Chou D, Hogan D, Zhang S, Moller AB, Gemmill A, et al. Global, regional, and national trends in maternal mortality between 1990–2015 with scenario based projections to 2013: a systematic analysis by the UN Maternal Mortality Estimation Interagency Group. *Lancet* 2016; 387: 462–474. pmid:26584737.
<https://pubmed.ncbi.nlm.nih.gov/26584737/>
- [2] World Health Organization. Trends in Maternal Mortality: 1990–2015. Estimates by

- WHO, UNICEF, UNFPA, World Bank Group and United Nations 2015, World Health Organization. Available from: <http://www.who.int/reproductivehealth/publications/monitoring/maternal-mortality-2015/en/> (cited 15 May 2018)
- [3] Boerma JT (1987). Levels of maternal mortality in developing countries. *Studies in Family Planning* 1987; 18(4), 213–221. pmid:3629663
<https://pubmed.ncbi.nlm.nih.gov/3629663/>
- [4] Khan KS, Wojdyla D, Say L, Gulmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: a systematic review. *Lancet* 2006; 367: 1066–1074. pmid:16581405
<https://pubmed.ncbi.nlm.nih.gov/16581405/>
- [5] Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V. et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 2012; 380: 2095–2128. pmid:23245604
<https://pubmed.ncbi.nlm.nih.gov/23245604/>
- [6] Say L, Chou D, Gemmill A, Tunçalp Ö, Moller A-B, Daniels J. et al. Global causes of maternal death: a WHO systematic analysis. *Lancet Glob Health* 2014; 2:e323–33. pmid:25103301
<https://pubmed.ncbi.nlm.nih.gov/25103301/>
- [7] World Health Organization/Centers for Disease Control and Prevention. Technical Guidelines for Integrated Disease Surveillance and Response in the African Region, Brazzaville, Republic of Congo and Atlanta, USA. World Health Organization & Center for Disease Control and Prevention. 2010. Available
<http://afro.who.int/publications/technical-guidelines-integrated-disease-surveillance-and-response-african-region-0.> (cited 12 May 2018)
- [8] Yego F, D'Este C, Byles J, Williams JS, Nyongesa P. Risk factors for maternal mortality in a Tertiary Hospital in Kenya: a case control study. *BMC Pregnancy Childbirth* 2014; 14:38. pmid:24447854
<https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/1471-2393-14-38>
- [9] Ujah IA, Aisien OA, Mutihir J.T, Vanderjagt DJ, Glew RH, Uguru VE. Factors contributing to maternal mortality in north-central Nigeria: a seventeen-year review. *Afr J Reprod Hlth* 2005; 9 (3):27–40.
<https://pubmed.ncbi.nlm.nih.gov/16623187/>
- [10] Chandra-Mouli V, Camacho AV, Michaud PA. WHO guidelines on preventing early pregnancy and poor reproductive outcomes among adolescents in developing countries. *J Adolesc Health*. 2013 May; 52(5):517–22. pmid:23608717
<https://pubmed.ncbi.nlm.nih.gov/23608717/>
- [11] Azuh DE, Azuh AE, Iweala EJ, Adeloye D, Akanbi M, Mordi RC. Factors influencing maternal mortality among rural communities in southwestern Nigeria. *Int J Women's Hlth* 2017; 9: 179–188.
<https://pubmed.ncbi.nlm.nih.gov/28442936/>
- [12] Bradshaw D. Maternal mortality ratio—trends in the vital registration data. *South Afr J Obst Gynaecol* 2012; 18(2):38–42.
<https://www.google.com/search?sxsrf=ALiCzsYbVcsCP-OTPTTJSwEI3SorI3pkuA:1659266428207&>

- [q=Bradshaw+D.+Maternal+mortality+ratio%E2%80%93trends+in+the+vital+registration+data.+South+Africa+J+Obst+Gynaecol+2012;+18\(2\):38%E2%80%9342.&spell=1&sa=X&ved=2ahUKEwjJsamQgaP5AhUqMuwKHAEaA0IQBSgAegQIARA2&biw=1536&bih=696&dpr=1.25](https://pubmed.ncbi.nlm.nih.gov/26584737/)
- [13] Mathers CD, Fat DM, Inoue M, Rao C, Lopez AD. Counting the dead and what they died from: an assessment of the global status of cause of death data. *Bull World Hlth Organ* 2005;83:171–177
<https://apps.who.int/iris/handle/10665/269355>
- [14] Iraq children and maternal mortality survey ICMMS 1993.
<https://www.google.com/search?q=org&sourceid=chrome&ie=UTF-8>
- [15] Iraq living condition survey ILCS 2004.
<https://reliefweb.int/report/iraq/iraq-living-conditions-survey-2004>
- [16] Multi indicators cluster survey MICS 6 2015
<https://mics.unicef.org/>
- [17] Central intelligence agency CIA 2013.
<https://www.google.com/search?q=Central+intelligence+agency+CIA+2013&oq=Central+intelligence+agency+CIA+2013&aqs=chrome..69i57.518212j0j4&sourceid=chrome&ie=UTF-8>
- [18] Diwania DOH statistics data.
- [19] Alkema L, Chou D, Hogan D, Zhang S, Moller AB, Gemmill A, et al. Global, regional, and national levels and trends in maternal mortality between 1990 and 2015, with scenario-based projections to 2030: a systematic analysis by the un maternal mortality estimation inter-agency group. *Lancet*. 2016;387(10017):462–474.
doi: 10.1016/S0140-6736(15)00838-7. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
<https://pubmed.ncbi.nlm.nih.gov/26584737/>
- [20] Veneranda M. Bwana, Formal analysis, Investigation, Writing – original draft, Writing – review & editing,#1 Susan F. Rumisha, Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Supervision, Validation, Writing – original draft, Writing – review & editing,#2 Irene R. Mremi, Investigation, Methodology, Supervision, Writing – review & editing,2,3 Emanuel P. Lyimo, Conceptualization, Investigation, Methodology, Supervision, Writing – review & editing,2 and Leonard E. G. Mboera, Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing,2,3,*
<https://pubmed.ncbi.nlm.nih.gov/30964909/>
- [21] Tanzania Demographic and Health Survey and Malaria Indicator Survey. Ministry of Health, Community Development, Gender, Elderly and Children (Tanzania Mainland), Ministry of Health (Zanzibar), National Bureau of Statistics, Office of the Chief Government Statistician, and ICF 2016. Dar es Salaam, Tanzania and Rockville, Maryland, USA.
<https://dhsprogram.com/pubs/pdf/fr321/fr321.pdf>
- [22] Maro EW, Mosha NR, Mahande MJ, Obure J, Masenga G. Ten years trend in maternal mortality at Kilimanjaro Christian Medical Centre Tanzania, 2003–2012: A descriptive

- retrospective tertiary hospital based study. *Asian Pac J Reprod* 2016; 5(3): 214–220. [[Google Scholar](#)]
<https://doaj.org/article/bc5fba6772c745a48fe111c356b94792>
- [23] Zimicki S. The Relationship between Fertility and Maternal Mortality In: Parnell.: *Contraceptive Use and Controlled Fertility: Health Issues for Women and Children. Committee on Population, National Research Council.* National Academy Press, Washington, DC: 1989. [[Google Scholar](#)]
- [24] Baul MK, Manjusha KK. Maternal mortality: A ten-year study. *J Indian Med Assoc.* 2004; 102:18–19. [[PubMed](#)] [[Google Scholar](#)]
- [25] Singh R, Sinha N, Bhattacharyya K, Ram R. Pattern of Maternal Mortality in a Tertiary Care Hospital of Patna, Bihar. *Indian J Comm Med.* 2009; 34(1): 73–74. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
- [26] Gumanga SK, Kolbila DZ, Gandau BBN, Munkaila A, Malechi H, Kyei-Aboagye K. Trends in maternal mortality in Tamale Teaching Hospital, Ghana. *Ghana Med J.* 2011; 45 (3): 105–110. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
- [27] Kazaura M, Kidanto H, Massawe S. Maternal mortality at Muhimbili National Hospital, Tanzania, 1999–2005: levels, causes and characteristics. *East Afr J Pub Hlth* 2016; (2): 23–25. [[Google Scholar](#)]
- [28] Evance I, Mbaruku G, Masanja H, Kahn K. Causes and risk factors for maternal mortality in rural Tanzania—case of Rufiji Health and Demographic Surveillance Site (HDSS). *Afr J Reprod Hlth* 2013; 17(3): 119–130. [[PubMed](#)] [[Google Scholar](#)]
- [29] Nelissen JT, Mduma E, Ersdal H, Evjen-Olsen B, Roosmalen J, & Stekelenburg J. Maternal near miss and mortality in a rural referral hospital in northern Tanzania: a cross-sectional study. *BMC Pregnancy Childbirth* 2013; 3: 141. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
- [30] Maro EW, Mosha NR, Mahande MJ, Obure J, Masenga G. Ten years trend in maternal mortality at Kilimanjaro Christian Medical Centre Tanzania, 2003–2012: A descriptive retrospective tertiary hospital based study. *Asian Pac J Reprod* 2016; 5(3): 214–220. [[Google Scholar](#)]
- [31] Zimicki S. The Relationship between Fertility and Maternal Mortality In: Parnell.: *Contraceptive Use and Controlled Fertility: Health Issues for Women and Children. Committee on Population, National Research Council.* National Academy Press, Washington, DC: 1989. [[Google Scholar](#)]
- [32] Baul MK, Manjusha KK. Maternal mortality: A ten-year study. *J Indian Med Assoc.* 2004; 102:18–19. [[PubMed](#)] [[Google Scholar](#)]
- [33] Singh R, Sinha N, Bhattacharyya K, Ram R. Pattern of Maternal Mortality in a Tertiary Care Hospital of Patna, Bihar. *Indian J Comm Med.* 2009; 34(1): 73–74. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
- [34] Gumanga SK, Kolbila DZ, Gandau BBN, Munkaila A, Malechi H, Kyei-Aboagye K. Trends in maternal mortality in Tamale Teaching Hospital, Ghana. *Ghana Med J.* 2011; 45 (3): 105–110. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
-

- [35] United Nations Population Funds. State of World Population, 2004; Accessed from: <http://www.unfpa.org/swp/2004/english/ch9/page5.htm>. Cited on March 21, 2018).
- [36] World Health Organization. Accelerating progress towards the attainment of international reproductive health goals: a framework for implementing the WHO Global Reproductive Health Strategy World Health Organization, Geneva; 2006. [[Google Scholar](#)]
- [37] Pembe AB, Paulo C, D'mello BS, van Roosmalen J. Maternal mortality at Muhimbili National Hospital in Dar-es-Salaam, Tanzania in the year 2011. *BMC Pregnancy Childbirth* 2014; 14:320 10.1186/1471-2393-14-320 [[PMC free article](#)] [[PubMed](#)] [[CrossRef](#)] [[Google Scholar](#)]
- [38] Umar AS, Kabamba L. Maternal mortality in the main referral hospital in Angola, 2010–2014: understanding the context for maternal deaths amidst poor documentation. *Int J MCH AIDS* 2016; 5 (1): 61–71. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
- [39] Okonofua F, Imosemi D, Igboin B, Adeyemi A, Chibuko C, Idowu A. et al. Maternal death review and outcomes: An assessment in Lagos State, Nigeria. *PLoS ONE* 2017; 12 (12): e0188392 10.1371/journal.pone.0188392 [[PMC free article](#)] [[PubMed](#)] [[CrossRef](#)] [[Google Scholar](#)]
- [40] Halim A, Utz B, Biswas A, Rahman F, van den Broek N. Cause of and contributing factors to maternal deaths; a cross-sectional study using verbal autopsy in four districts in Bangladesh. *BJOG* 2014; 121 (Suppl. 4): 86–94. [[PubMed](#)] [[Google Scholar](#)]
- [41] Fikree FF, Mir AM, Haq I. She may reach a facility but will still die! An analysis of quality of public sector maternal health services, District Multan, Pakistan. *J Pakistan Med Assoc* 2006; 56:156. [[PubMed](#)] [[Google Scholar](#)]
- [42] Filippi V, Chou D, Ronsmans C, Graham W, Say L. Levels and Causes of Maternal Mortality and Morbidity In: Black R.E., Laxminarayan R., Temmerman M. et al. (Editors): *Reproductive, Maternal, Newborn and Child Health: Disease Control Priorities*. 3rd Edition Washington (DC): The International Bank for Reconstruction and Development / The World Bank, 2016. [[Google Scholar](#)]
- [43] World Health Organization. Reproductive health strategy to accelerate progress towards the attainment of international development goals and targets World Health Organization, Geneva; 2004. [[PubMed](#)] [[Google Scholar](#)]
- [44] Storm F, Agampodi S, Eddleston M, Sørensen J.B, Konradsen F, Rheinländer T. Indirect causes of maternal deaths. *Lancet Glob Health* 2014; 2 (10):e556. [[PubMed](#)] [[Google Scholar](#)]
- [45] Trends and causes of maternal death at the Lagos University teaching hospital, Lagos, Nigeria (2007–2019) Joseph A. Olamijulo, 1,2 Gbenga Olorunfemi,3 and Halimat Okunola2