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MATERNAL MORTALITY AND ITS RELATIONSHIP WITH HEALTHCARE WORKERS' KNOWLEDGE - AN EVALUATION OF HOSPITALS IN TABUK PROVINCE, KINGDOM OF SAUDI ARABIA

Aziza Abdullah M. Al-Harbi[i],
Rajaa M. Al-Raddadi
Faculty of Economics and Administration
King Abdulaziz University,
Jeddah, Kingdom of Saudi Arabia

Abstract:
Recently, the Kingdom of Saudi Arabia, has witnessed a progressive decrease in maternal mortality rate. A study conducted by (Najimudeen, M. et al, 2018), reveal that, the reduction of maternal mortality rates in the community is envisaged through greater patient acceptance of medical advice, family spacing and proficient obstetric services. The main objective of the current study is to examine the trends of maternal mortality rate per 10,000 live births during a 10-years period (2005 – 2014), and to assess the reporting of maternal mortality trends at Tabuk region hospitals, in Saudi Arabia. **Methods:** The descriptive approach was used to collect data needed, using two questionnaire methods, RAMOS questionnaire with sample size (34) cases of maternal mortality. Descriptive and inferential statistics techniques used for data analysis by using (SPSS) version 20. **Findings:** The study concluded that the majority of deaths among reproductive women have happened for normal reasons, the study showed that around 88.0% of maternal deaths at the age category (25-44) years, and the MMR during the period (2005-to 2014) is reaching 12.2% for (106,326) of live birth. The results reveal that, there is a statistically significant positive association between maternal death registration reports and healthcare workers' knowledge in most hospitals. **Conclusion:** The study concluded that there is underreporting of maternal mortality index. The study recommended that it is necessary to improve the maternal mortality registration via supporting registration systems and biostatistics and use of customized calculators creating a system for maternal mortality registration to report about maternal mortality deaths and developing a committee to monitor and follow maternal mortality registration.

Keywords: maternal mortality rate, Tabuk hospitals, registration reporting system, healthcare workers' knowledge

[i] Correspondence: email mustafa_0114@hotmail.com

1. Introduction

The increased demand of healthcare services in Saudi Arabia have put heavy responsibilities on the Ministry of health to expand the level of these services in most part of the Kingdom. The Saudi Ministry of Health (MOH) provides over 60% of these services while the rest shared among other government agencies and the private sector [1]. A series of development plans in Saudi Arabia have established the infrastructure for the expansion of curative services all over the country. Building a health information system is a core objective for the ministry of health that is to provide accurate information about all issues regarding the development of healthcare services [2], in particularly to reduce the level of maternal mortality trends in Saudi Arabia among the reproductive women [3]. Maternal mortality remains a major marker of the performance of health systems it is a sentinel event, reflecting access to and quality of prenatal and obstetric care, as well as the health status of reproductive-aged women [4]. The level of health services provided in the Saudi Arabia has witness a great development during the last forty years, which reflected in the health indicators, according to the statistics of World Health Organization (WHO) for the year 2015. The healthcare indicators showed that the maternal mortality rate dropped to 12 deaths per 10 thousand live births in 2015, compared with 41 deaths per 10 thousand live births by the year 1990 [4].

2. Background of the Study

World Health Organization in its report on ICD (International Classification of Diseases) [8] identified various definitions relating to maternal mortality. These include:

- Maternal death: 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 accidental or incidental causes.
- Pregnancy-related death: The Pregnancy-related death is death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death.
- Late maternal death: The Late maternal death is death of a woman from direct or indirect obstetric causes, more than 42 days, but less than one year after termination of pregnancy.
- Maternal mortality ratio (MMR): Maternal mortality ratio is number of maternal deaths during a given time period per 10, 000 live births during the same time period.
- Maternal mortality rate (MM Rate): Maternal mortality rate is number of maternal deaths in a given period per 1000 women of reproductive age during the same time period.

- Misclassification: Misclassification refers to incorrect coding in civil registration, due either to error in the medical certification of cause of death or error in applying the correct code.
- Incompleteness: Incompleteness refers to incomplete death registration. It includes both the identification of individual deaths in each country and the national coverage of the register.
- Underreporting: Underreporting is a combination of misclassification and incompleteness.

A comprehensive review of the studies would enhance the understanding of the practices, procedures and methods followed in reporting and updating MMR related information across the various regions.

A study [9] focusing on classification differences and maternal mortality was conducted in Europe. A comparison between classification ways of maternal deaths in national statistical offices in Europe was done. Data on pregnancy-associated deaths were collected in 13 European countries. Cases were classified by a European panel of experts into obstetric or non-obstetric causes. An ICD-9 code (International Classification of Diseases) was attributed to each case. These were compared to the codes given in each country. Correction indices were calculated, giving new estimates of maternal mortality rates. It was figured out that the European panel attributed more deaths to obstetric causes. In the other countries, no differences were detected. According to official published data, the aggregated maternal mortality rate for participating countries was 7.7 per 100,000 live births, but it increased to 8.7 after classification by the European panel ($P < 0.001$) [9].

Another study [10] focusing on underreporting of maternal deaths on death certificates and the magnitude of the problem of maternal mortality, the extent to which maternal deaths are underreported on death certificates found interesting results. The authors collected data on maternal deaths from death certificates, linkage of death certificates with birth and fetal death records, and review of medical examiner records. As a result, it was found that thirty-eight percent of maternal deaths were unreported on death certificates. Half or more deaths were unreported for women who were undelivered at the time of death, experienced a fetal death or therapeutic abortion, died more than a week after delivery, or died as a result of a cardiovascular disorder [10]. A similar nationwide study [11], focusing retrospective crosscheck of the three available maternal mortality registration systems in Netherlands was conducted using a questionnaire to senior obstetricians in all hospitals. The study has found that the officially reported maternal mortality rate during the study period was 7.1 per 100,000 live births (133 maternal deaths per 1,862,985 live births), but the data from the study indicated that the rate should be at least 9.7 per 100,000 live births (180 maternal deaths) [11].

A cross-national study [12] in US and Europe was conducted focusing on pregnancy related mortality for international comparison. The study found identified 404 pregnancy-associated deaths; underestimation of mortality causally related to pregnancy

based on International Classification of Diseases cause-of-death codes alone varied from 22% in France to 93% in Massachusetts, and underreporting was greater in the regions with lower initial maternal mortality ratios. The study [12] has suggested that linkage of births and deaths registers should routinely be used in the ascertainment of pregnancy-related deaths, and extension of the definition of a maternal death should be considered.

A similar study [13] evaluated the trend in maternal mortality registration in Iraq. The study found that, more than one and a half fold increase in the number of registered maternal deaths over the seven years period after implementing the special inquiry form, with marked variation in registration between different governorates and within the same governorate; and concluded that implementing a special maternal mortality inquiry form, by the Ministry of Health, lead to noticeable improvement in registering maternal mortality in health facilities [13]. A similar study [20] in Surinam, showed a maternal mortality ratio (MMR) of 240 per 100000 live births, which was almost four times higher than the official MMR.

A similar study [15] was conducted focusing on trends in maternal mortality at the Mukalla City in Yemen was conducted. The aim of this study was to highlight the main cause of avoidable death that leads to maternal mortality among those admitted to Al Mukalla hospital, Hadhramout, Yemen. The methodology used in this research is a survey that was carried out in Al-Mukalla City, the capital of Hadhramout Province. Variables included in this study are those related to dates of admission and of death, patients' age, number of parity, mode of delivery of the last baby. In addition, some clinical data were included related to causes leading to death and underlying condition of death. Results show that of the total 39651 live birth recorded in the hospital during the study period (2001 to 2010), 42 maternal deaths were recorded which gives an overall Maternal Mortality Ratio (MMR) of 106 per 100,000 live births. Bleeding was among the top causes of maternal deaths in this study (28.6%) followed by hypertensive disorder, pulmonary embolism, and anemia (21.4%, 9.4%, 9.4%, respectively) [15].

All studies reviewed in this paper depended on civil affairs as the main and essential source of information to determine the actual number of maternal mortality ratio in women during childbearing age. Despite of the weakness of the registration in some countries, they were the beginning of study and investigation of the data in hospitals, which has given support and accuracy to the data that have been collected in these studies. In addition, majority of the studies found irregularities in the reporting and updating of information relating to MMR.

3. Methodology

The study focused mainly on two objectives: to investigate the trends in MMR at Tabuk hospitals for a period of 10 years from 2005-2014; and to assess under-reporting and misclassification of maternal mortality accordingly, the study design is explained for the two objectives.

3.1 Study Setting & Participants

This study was conducted using a retrospective reproductive age mortality study (RAMOS) method with multiple data sources. The target population for the RAMOS study included all reproductive age Deaths listed in Death Certificates of women from various hospitals in Tabuk. Four sources of data were used for the identification of deaths to women of reproductive age: death record; regional statistics (provided by regional governors); and community informants contacted during the field investigation of known death cases as indicated in Table 1.

Table 1: Maternal mortality data sources and data collection methods

Method	Event measured	Precision and uncertainty	Reference period
Health facility reporting	Maternal mortality	HMIS generally covers only public health facilities; captures maternal deaths occurring in obstetric wards; maternal deaths in emergency and specialist wards often missed	Usually recent reference period
RAMOS	Combination of maternal and pregnancy-related mortality	Depends on the ability of investigators to identify all maternal/pregnancy related deaths, and on the quality of the medical records and verbal autopsies	Usually covers multiple years

Note: HMIS: Health Management Information System; RAMOS: Reproductive Age Mortality Studies

3.2 Questionnaire

RAMOS questionnaire is used to get more accurate results about maternal mortality registration. The different types of information collected using the RAMOS questionnaire is presented in the Figure 1.

Reproductive Age Mortality Studies (RAMOS) or census-based mortality studies– are valid alternatives to measure maternal mortality and can be a source of more detailed information about the circumstances of maternal deaths. This report summarizes the results from RAMOS Georgia, the first national RAMOS study ever conducted in Eastern Europe and the Commonwealth of Independent States. This is the first national RAMOS study in Europe that employed a full investigation of all deaths to women of reproductive age rather than a sample-based data collection [16].

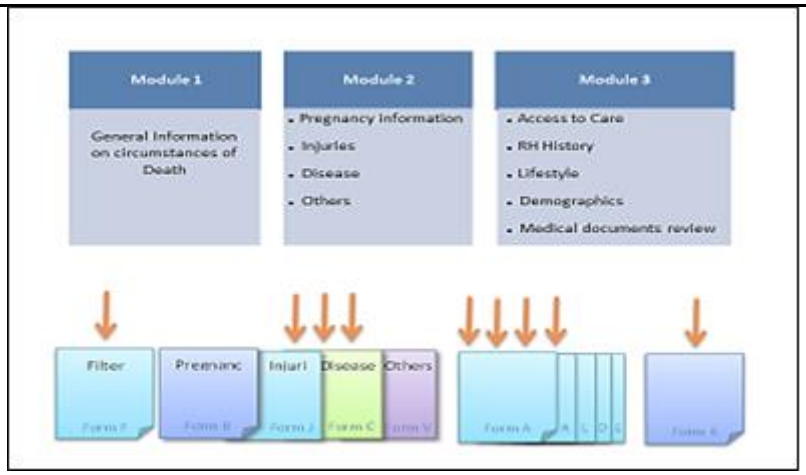

Figure 1: Information Modules in RAMOS Questionnaire

The questionnaire was organized in three modules, each containing from one to five questions. Briefly, the questionnaire content included:

- Part 1: Consisted of a filter used to: screen out deaths that may have been misclassified in the sources used for case identification (i.e. deaths to males; deaths to women younger than 15 or older than 49 years).
- Part 2: Consisted of information about the type and timing of death.
- Part 3: Consisted of background and demographic characteristics for maternal mortality.

3.3 Inclusion

All maternal deaths (during pregnancy or ≤ 42 days after pregnancy ended) and during the reproductive age (15-49 years) occurring during the period 2005-2014 were included

3.4 Sampling

Ten hospitals in the Tabuk region were identified for the study, and a detailed review of all death records relating to maternal mortality was conducted. A total of 34 cases were identified from various hospitals as shown in the Figure 1.

3.5 Statistical Analysis

Selecting the right statistical methods depends on the nature of the data and the relationship between the method and the research objective. This study used the following techniques relevant to the research question and framework: descriptive statistics such as frequencies, percentages, mean, standard deviation. In addition to that, Chi-Square test, Nominal regression, and analysis of variances including T-test, and ANOVA. Further Cronbach Alpha was used to measure reliability of healthcare workers survey.

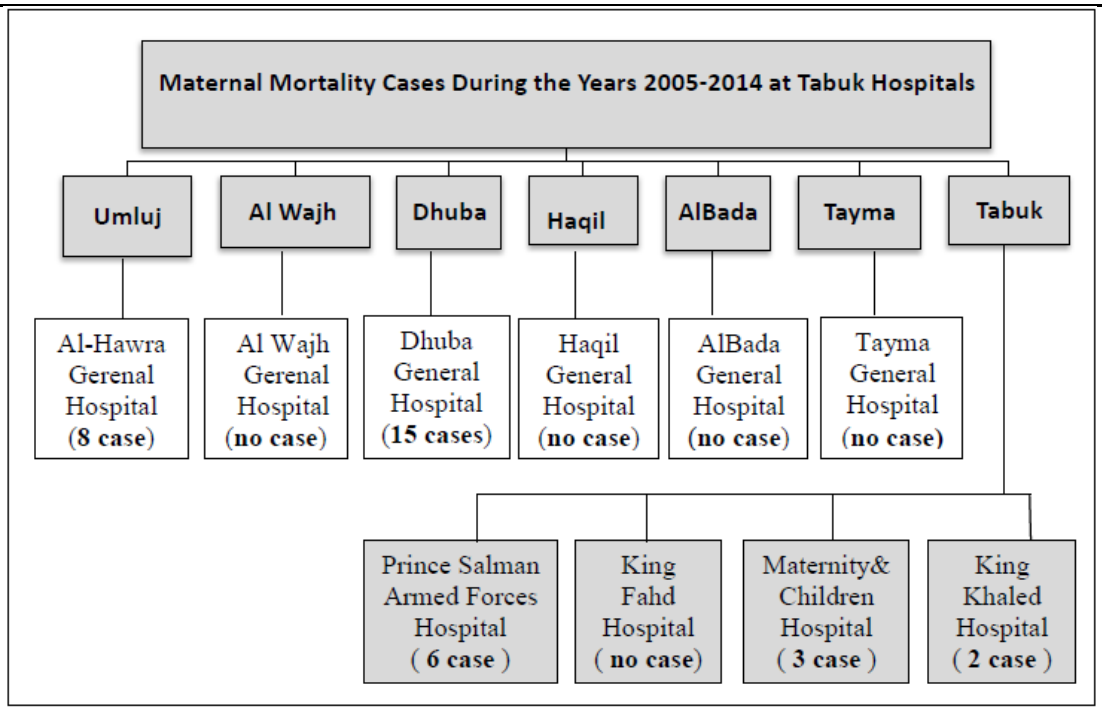

Figure 2: Sample Collection for assessing underreporting & misclassification

Also the research use the following techniques:

- Maternal Mortality Ratio (MMRatio)

$$MMRatio = (MDBirths) * 10{,}000$$

where:
MD is the number of maternal deaths in a period, and
Births is the number of births in the same period.

- Maternal Mortality Rate (MMRate)

$$MMRate = (MDPYLf) * 1000$$

where:
MD is the number of maternal deaths in a period, and
PYLf is the person years lived by women of reproductive age (normally 15 to 49) in the period.

- Line curve was used to compare Maternal Mortality Registration to Health Statistical Year Book & Maternal Mortality Registration to Current Study.

4. Results

Regarding the sample distribution according to nationality, the Saudi reproductive women case of the study comprised about 47.1% of the total sample. Additionally, there are about 38.2% of the women case of the study their age at death is between (25-to 34) years, whereas 50.0% at the age class (35-to 44) years, while 5.9% in the age class (15- to 24) years, whereas 5.9% at the age 45 years and above. Therefore, the majority of women are in the reproductive age as they comprised about 88.2% of the total sample. Comprehensive findings from RAMOS study presented in Table 2.

The analysis of the maternal mortality rate, and maternal mortality ratio during the period (2005 - 2014) resulted from the data collected across ten hospitals in Tabuk region, reveal that the maternal mortality rate was successively increasing from 0.01 in the period (2005-2006) to 0.122 in the period (2013-2014) while the maternal mortality ratio was increasing from 2.48% in the first period to 2.76% at the end of the period of the study. Therefore, both the maternal mortality rate and ratio increasing throughout of the period of the study.

In regards to the sample analysis according to residence where the death occurred, the majority of deaths (70.6%) have been occurred in rural areas, whereas 29.4% in Urban areas. Therefore, the rural areas comprised the majority of deaths, which indicated that there is less medical care provided to the reproductive women in rural areas. In addition, all participants with 100.0% reported that the death was happened for normal reasons.

Regarding the type of death for the reproductive women, the majority of participants 82.3% reported that, the type of death is unknown, whereas 5.9% classify the other type of death into delivery death, abortion and antenatal death with same percent. In regards to timing of death, results show that, there are about 76.5% of the participants reported that the timing of death has been within 42 days after delivery, which indicates that the death of reproductive women has happened after they stay for a long period in the hospital. While 20.6% reported that, it has been during delivery, whereas 2.9% have been during pregnancy.

Table 2: Demographic items

Demographic items		**Frequency**	**%**
Name of hospitals	Maternity and Children Hospital at Tabuk	3	8.8
	King Khaled Hospital at Tabuk	2	5.9
	Dhuba General Hospital at Dhuba	15	44.1
	Al-Hawra General Hospital at Umluj	8	23.6
	Prince Salman Armed Forces Hospital- Tabuk	6	17.6
The position of the respondent	Consultant physicians	15	44.1
	Residents physician	1	2.9
	Nurse	18	52.9
Place of death	Home	1	2.9
	Public hospital	27	79.4
	Martial hospital	6	17.6
Residence where	Urban	10	29.4

death occurred	Rural	24	70.6
Reasons for death	Normal death	34	100.0
	Cancer	0	0.0
	Chronic disease	0	0.0
Type of death	Delivery death	2	5.9
	Abortion	2	5.9
	Antenatal	2	5.9
	Unknown	28	82.3
Timing of death	During Pregnancy	1	2.9
	During Delivery	7	20.6
	Within 42 days after delivery	26	76.5
The nationality	Saudi	16	47.1
	Non –Saudi	18	52.9
Age	15-24 years	2	5.9
	25- to 34 years	13	38.2
	35- to 44 years	17	50.0
	45+	2	5.9
Academic qualification	Less than higher school	21	61.8
	High school	6	17.6
	Diploma	7	20.6
Educational status	Working women	7	20.6
	House-wife	27	79.4
Social income group	Below 5000 SR	20	58.8
	5001- to 10000 SR	11	32.4
	10001- to 15000 SR	3	8.8

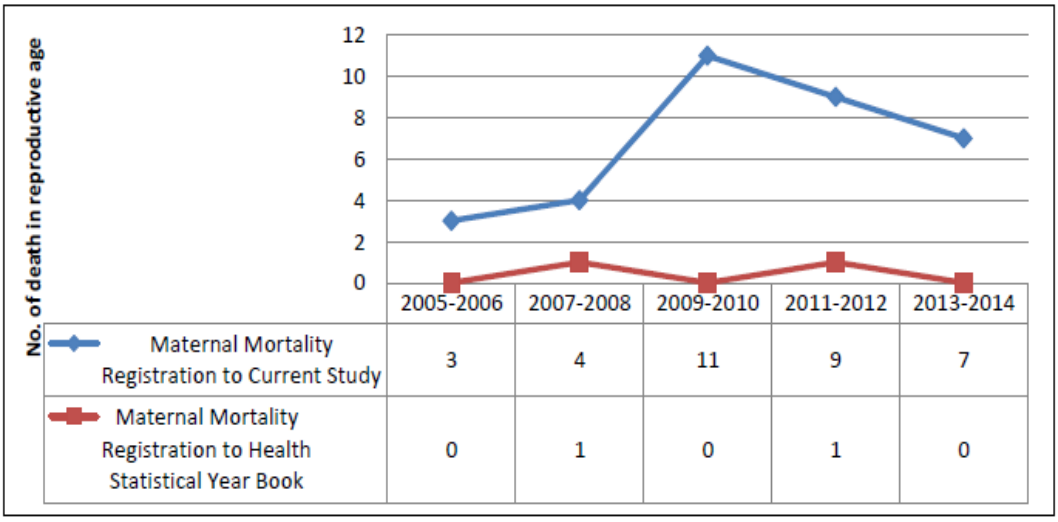

Figure 2: Trends in Maternal Mortality during the years 2005-2014

Finally, comparing the Maternal Mortality Registration of the current study with the statistical year book [18] released by the MOH, a line curve graph as shown in Figure 2 showing the difference and the gaps in the findings from 2005 to 2014.

4.1 Healthcare workers survey results

In concern with how frequent healthcare workers conduct or assist delivery cases, it was found that the majority 47.3% do not assist delivery cases, whereas 31.6% assist more than five cases peer week, 15.4% conduct or assist between (6-10) cases, while few 5.8% assist between (1-5) per week. The results also show that healthcare workers have no sufficient knowledge about the cases delivered to hospitals at different time. While 82.8% reported that, their source of information about the deaths and its causes is a responsible doctor. In addition to that, there is a large percent of the women pregnancy history was not checked out, which is a clear indicator for insufficiency of information about women deaths and causes. Because the medical history for the patient is one of the most important things for the treatment of all patients, regarding the maternity mortality, checking out pregnancy history is very important for the physician to control what the women is suffering of, and can be able to describe the suitable treatment for her.

The results in Table 3, also reveal that, 88.5% of healthcare workers confirmed that, the doctor who handle the case is authorized to issue the death certificate. The results found that, although the majority of hospitals 91.6% keep statistics for deaths and its causes, but only 31.6% of the departments conduct statistics in regards to maternal mortality.

Table 3: Healthcare workers attitudes toward maternal mortality reporting and registration (sample size N = 656)

Statements		**Frequency**	**%**	**Chi-Square**	**d.f**
Frequent assist delivery cases	1-5 per week	38	5.8	262.26**	3
	6-10 per week	101	15.4		
	Not assist	310	47.3		
	More than 5 per week	207	31.6		
Source of information for deaths and its causes?	Responsible doctor	543	82.8	147.31**	1
	Self-checking	113	17.2		
Do you check out pregnancy history for women deaths?	Yes	216	32.9	237.96**	2
	No	387	59.0		
	Sometimes when death is close to delivery	53	8.1		
What technology do you use for registering deaths?	Paper	242	36.9	14.31**	1
	Computer technology	173	26.4		
	Both	241	36.7		
Who is authorized for issuing death certificates?	Doctor who handle the case	581	88.5	1417.44**	1
	Another doctor	17	2.6		
	Responsible of medical records	45	6.9		
	Nurse	13	2.0		
Has your department conducted any statistics regarding maternal mortality?	Yes	206	31.4	90.76**	2
	No	450	68.6		

Does the hospital keep statistics for deaths and its causes?	Yes	601	91.6	454.45**	1
	No	55	8.4		
Do you think that an information note about last pregnancy should be added to death registration form (if not included)?	Yes	415	63.3	46.15**	1
	No	241	36.7		
Do you think that a health record for the last pregnancy period should be added to death registration form?	Yes	424	64.6	56.20**	1
	No	232	35.4		
Do you think that the health record of dead women who had given birth (during last year prior to death) should be added to death registration form?	Yes	402	61.3	33.39**	1
	No	254	38.7		

**Chi-Square is statistically significant at the (0.01) significant level.

In regards to overall healthcare workers knowledge and awareness of maternal mortality trends reporting the results in table 4, reveal that, the majority 46.8% who have no knowledge, while 36.9% have a knowledge, whereas 16.3% do not know. Therefore, lack of knowledge of maternal mortality reporting is one of the crucial factors of under reporting of maternal mortality in Tabuk hospitals in Saudi Arabia. Therefore, it was very necessary to train all staff about how to report and register maternal mortality trends in order to provide accurate information to the ministry of health and other parts that in concern.

Table 4: Overall healthcare workers knowledge regarding maternal mortality trends reporting

Responses	**Frequency**	**Percent %**
Yes	242	36.9%
No	307	46.8%
Don't know	107	16.3%
Total	656	100.0%

To examine whether there is a significant difference between healthcare workers knowledge in terms of reporting and non-reporting T-test statistics was run. (See Table 5). The results show that T-test value is equal to (-12.60) at P-value less than the significant level (0.01) which indicated that there is statistically significant difference between healthcare workers knowledge in terms of reporting and non-reporting of maternal mortality trends. The significant difference is positively related to the side of non-reporting. Meaning that, the majority of healthcare workers have no sufficient knowledge of maternal mortality trends.

Table 5: Shows T-test analysis to test significant differences between healthcare knowledge (reporting, non-reporting) regarding maternal mortality trends

Knowledge of	N	Mean /%	Std.	T-test	df	P-value
Reporting	242	1.50 (36.9%)	0.25	-12.60	654	0.00**
Non-reporting	414	1.72(63.1%)	0.20			

** indicated that, the difference is statistically significant at the (0.01) level

4.2 Testing research hypotheses

The current research assume that,

H1: Knowledge of healthcare workers have no effect on reporting of maternal mortality at Tabuk hospitals, Saudi Arabia.

To test this hypothesis, nominal regression analysis was run (See table 6). The results reveal that, the value of determination coefficient (R^2) is equal to (0.18) indicated that healthcare workers knowledge can interpret and explain the variation in maternal mortality trends reporting by 18.0%, if other things remain equal. Meaning that healthcare workers knowledge has explained only 18% of variations in maternal mortality reporting. These results supported what we have presented before that there is underreporting and misclassification of maternal mortality trends at the hospitals under study in Tabuk region. Furthermore, the value of Chi-Square indicated that there is statistically significant relationship between insufficient knowledge of maternal mortality, and underreporting of maternal mortality trends in hospitals under study.

Table 6: Nominal regression analysis results to examine the effect of healthcare workers knowledge on maternal mortality reporting

	Coefficients	Chi-Square	P-value	df
Constants (C)	315.61	130.78**	0.00	1
Healthcare workers knowledge	184.8			
	R^2 =0.18			

H2: There are no statistically significant variations among healthcare workers in regards to their knowledge of maternal mortality report and registration, and their knowledge of maternal mortality, related to gender, educational level, and years of experience.

To test this hypothesis, One-Way Analysis of Variances (ANOVA) technique was used to examine if there are statistically significant variations related to education level, and years of experience, while T-test was used to examine differences related to gender. The results demonstrated as in the following tables.

Table 7: Examining significant differences related to education level

Variables	Sources of variation	Sum of squares	d.f	Mean square	F-statistics	P-value (sig)
Maternal mortality report and registration	Between groups	0.354	2	0.177	2.94	0.054
	Within groups	39.355	653	0.060		
	Total	39.710	655			
Healthcare workers knowledge of maternal mortality	Between groups	2.332	2	1.166	7.941	0.00**
	Within groups	95.889	653	0.147		
	Total	98.221	655			
Tabulated F, was calculated at (0.05) significant level and degrees of freedom (2, 653) equal to (3.00)						

**difference is significant at the (0.01) significant level.

Table 7 shows that there are no statistically significant differences between healthcare workers knowledge of maternal mortality reporting and registration as the P-value is greater than (α =0.05). While there are statistically significant, variation related to education level regarding healthcare workers knowledge of maternal mortality trends. To test for which education level the variation exist, multiple comparison analysis was run , and the results reveal that, the significant difference exist and positive to side of participants who were postgraduate (see Table 8).

Table 8: Multiple comparisons analysis

		Mean difference by education level		
Education level	**Mean**	**Diploma**	**Bachelor**	**Postgraduate**
Diploma	1.80	-	0.08*	-0.08*
Bachelor	1.73	-0.08*	-	-0.16*
Postgraduate	1.88	0.08*	0.16*	-

Table 9: Analysis of variances to examine significant variations related to years of experience

Variables	Sources of variation	Sum of squares	d.f	Mean square	F-statistics	P-value (sig)
Maternal mortality report	Between groups	0.685	2	0.342	5.73	0.003**
	Within groups	39.025	653	0.06		
	Total	39.710	655			
Healthcare workers knowledge about maternal mortality	Between groups	5.041	2	2.521	17.66	0.00**
	Within groups	93.180	653	0.143		
	Total	98.221	655			
Tabulated F, was calculated at (0.05) significant level and degrees of freedom (2, 653) equal to (3.00)						

**difference is significant at the (0.01) significant level.

Table 9, show that, there are statistically significant variations between healthcare workers in regards to maternal mortality reporting, and healthcare workers knowledge related to years of experience. To examine to which years of experience category the significant variations exist, multiple comparison analysis was run using L.S.D method.

The results in table 10, reveal that the significant variation were positive to the side of participants with high years of experience extended between (6-10) and more than 10 years.

Table 10: Multiple comparisons analysis

		Mean difference by years of experience		
		Maternal mortality reporting		
Years of experience	**Mean**	**Less than 5 years**	**6-10 years**	**More than 10 years**
Less than 5 years	1.60	-	-0.07*	-
6-10 years	1.67	0.07*	-	-
More than 10 years	1.62	-	-	-
		Healthcare workers knowledge of maternal mortality		
Less than 5 years	1.66	-	-0.20*	-0.15*
6-10 years	1.86	0.20*	-	-
More than 10 years	1.81	0.15*	-	-

5. Discussion

The current study main objective is to evaluate and measure the maternal mortality trends in Tabuk Hospital, in Saudi Arabia, and to assess the reporting of maternal mortality. After analysis of the data collected in regards to the issue of the study, the he study concludes with a set of findings. One of the most important results of this current study is that, most of the deaths in Tabuk hospitals are happening for normal reasons. This finding was totally, different with the outcomes of the research conducted by Salanave, et al. [9], regarding the classification differences and maternal mortality done in Europe, which figured out that the European panel attributed more deaths to obstetric causes. While the current study reported that, the majority of reproductive women death occurred after 42 days of arrival to hospitals, and the majority of women are in the reproductive age (25-35) years, with less than high education and among the low income groups, which goes in line with the result of a study conducted by Al-Meshari, et al. [19] A prospective national survey was done on a multistage sample of the hospitals in Saudi Arabia. The setting was a maternal mortality survey committee in Riyadh with field/area coordinators in different areas of the Kingdom. The subjects were women who died or who were dead on arrival in hospital during pregnancy or within 6 weeks of the end of pregnancy, and it point out that the mortality was higher in older multiparous women of low income and no education.

Regarding the reasons and type of death, our current study concluded that almost reproductive women death was related to normal reasons, while the type of death was unknown, whereas few the types of death related to abortion and antenatal, which was quite different to conclusion of the study conducted by Deneux-Tharaux, et al. [12] on Pregnancy-Related Mortality in the United States and Europe. The study concluded that the distribution of causes of pregnancy-related mortality was specific to each region. The leading causes of death were cardiovascular conditions in Massachusetts; hemorrhage, pregnancy-induced hypertension, and peripartum cardiomyopathy in North Carolina;

non-cardiovascular medical conditions in Finland; and hemorrhage in France. It was concluded that, linkage of births and deaths registers should routinely be used in the ascertainment of pregnancy-related deaths.

With regard to reporting and registering of maternal mortality in Tabuk region hospitals, this study found that there are statistically significant variations between hospitals case of the study in reporting and registration of maternal mortality of the reproductive women, and that may be attributed to lack of an official form applied in all hospitals enforced by the Ministry of health. This results was quite different with the outcomes of a study conducted by Batoolea al. [13] evaluated the trend in maternal mortality registration during the period 2001-2007, in which found more than one and a half fold increase in the number of registered maternal deaths over the seven years period after implementing the special inquiry form, with marked variation in registration between different governorates and within the same governorate. They concluded that implementing a special maternal mortality inquiry form, by the Ministry of Health, lead to noticeable improvement in registering maternal mortality in health facilities, yet further studies are recommended to review each case of death.

6. Conclusion

The main aim of the study was to investigate the MMR trends in Tabuk hospitals for a period of 10 years and assess the reporting of maternal deaths in these hospitals. To achieve this objective the researcher collected the data needed using two methods RAMOS Questionnaire, and healthcare workers survey. Different statistical techniques have been used for data analysis. The study concluded with many valuable findings to decision -making process in the future to improve the current situation. the most important ones are that most death encountered are from the rural areas of Tabuk region, which indicated that there is less knowledge about the initial medical care services to women in the reproductive age reaching around 88.0%. The study discovered that in most cases of deaths, the type of death was unknown, and the majority of death happens within 42 days after delivery to public hospitals. The study expected that low level of education of women, beside low social income groups regarded as the most important factors for death. In conclusion, there is underreporting of maternal mortality trends in almost all hospitals in the Tabuk region, which considered as one of the major drawbacks that would affect the development of health plan by the government. The study conclude that, there is a lack of knowledge of health workers in the statistical registration of cases of maternal mortality. Based on that, the study suggested that, there is a need to form a committee responsible of recording and registration, and to conduct analysis of the information about the maternal mortality in most hospitals and to be committed to the Ministry of health. In addition to that, there is an urgent need to depend on the international classification of diseases used in statistics regarding death causes and increase awareness among the women regarding the medical care during the pregnancy to avoid any risks.

Conflict of Interest Statement

The authors declare no conflicts of interests.

About the Author

Al-Harbi, Azizah Abdullah Mohammed, BSC, faculty of Pharmaceutical, King Saud University, Kingdom of Saudi Arabia (KSA), MSC in Healthcare Administration in Hospitals, King Abdulaziz University, KSA. Current position: The supervisor of TQM unit in Medical Administration at Tabuk University, KSA.

References

[1] Sebai Z. A., Milaat W. A., Al-Zulaibani A. A. (2001). Health Care Services In Saudi Arabia: Past, Present and Future. Journal of Family & Community Medicine, 8(3):19-23.

[2] Kingdom of Saudi Arabia, "National Transformation Program 2020", 2017.

[3] C. Pinzón-Flórez, J. Fernández-Niño, M. Ruiz-Rodríguez, Á. Idrovo and A. Arredondo López (2015). "Determinants of Performance of Health Systems Concerning Maternal and Child Health: A Global Approach", Plos One, vol. 10, no. 3.

[4] World Health Organization (2015). Maternal mortality in 1990-2015. [Online]. Available: http://www.who.int/gho/maternal_health/countries/sau.pdf. [Accessed: 17- Mar- 2018].

[5] World Health Organization. Trends in Maternal Mortality: 1990 to 2013,Estimates by WHO, UNICEF, UNFPA, The World Bank and the United Nations Population Division. Retrieved from WHO. (May 2014).

[6] Susie Jentoft, Vibeke Oestreich Nielsen and Dag Roll-Hansen (2014). Adjusting maternal mortality data for international comparisons The case of vital registration systems, Discussion Papers No. 773, Statistics Norway, Research Department. March.

[7] S. Mills, Maternal Death Audit as a Tool Reducing Maternal Mortality, [online]. Available at: http://siteresources.worldbank.org/INTPRH/Resources/376374-1278599377733/MaternalDeathAuditMarch22011.pdf [Accessed: 17- Mar- 2018].

[8] World Health Organization (1992). World Health Organization, International Classification of Diseases and Related Health Problems, Tenth Revision, Vol 1. Geneva.

[9] B. Salanave, B. Colle, N. Varnoux, S. Alexander and A. Macfarlane (1999). Classification differences and maternal mortality: a European study. MOMS Group. Mothers' Mortality and Severe morbidity, International Journal of Epidemiology, vol. 28, no. 1, pp. 64-69, .

[10] I. Horon (2005). Underreporting of Maternal Deaths on Death Certificates and the Magnitude of the Problem of Maternal Mortality, American Journal of Public Health, vol. 95, no. 3, pp. 478-482.

[11] N. Schuitemaker, J. Vanroosmalen, G. Dekker, P. Vandongen, H. Vangeijn and J. Gravenhorst (1997). Underreporting of maternal mortality in The Netherlands, Obstetrics & Gynecology, vol. 90, no. 1, pp. 78-82, .

[12] C. Deneux-Tharaux, C. Berg, M. Bouvier-Colle, M. Gissler, M. Harper, A. Nannini, S. Alexander, K. Wildman, G. Breart and P. Buekens (2005). Underreporting of Pregnancy-Related Mortality in the United States and Europe, Obstetrics & Gynecology, vol. 106, no. 4, pp. 684-692.

[13] Batool A. G. Yassin & Enaam Hasson Al-Saneed (2009). Hospital Registration of Maternal Mortality in Iraq 2001-2007. Iraqi J. Comm. Med.((1)).Jan, 2009.

[14] A. McCaw-Binns, J. Mullings and Y. Holder (2014). Vital registration and under-reporting of maternal mortality in Jamaica, International Journal of Gynecology & Obstetrics, vol. 128, no. 1, pp. 62-67.

[15] Bin-Berik A. S., Bawazir A. A. Trends in Maternal Mortality at the Mukalla City, Yemen, 2000–2010. J Community Med Health Educ. 2012; 2: 1-4.

[16] Serbanescu, Florina, Leo Morris, Nick Nutsubidze, Paata Imnadze, and Marina Shaknazarova (2001). Reproductive Health Survey: Georgia. 1999–2000, Atlanta, Ga.: Centers for Disease Control and Prevention and Tbilisi, Georgia: National Center for Disease Control.

[17] World Health Organization (2012). Improving the quality and use of birth death and cause of death information: guidance for a standards based review of country practices.

[18] Ministry of Health, Statistical Yearbook 1437. [online]. Available at: https://www.moh.gov.sa/en/Ministry/Statistics/book/flash/Statistical-Yearbook-1437H/MOH_Report_Statistical-Yearbook-1437H.html [Accessed: 17- Mar- 2018].

[19] A. Al-Meshari, S. Chattopadhyay, B. Younes and M. Hassonah, "Trends in maternal mortality in Saudi Arabia", International Journal of Gynecology & Obstetrics, vol. 52, no. 1, pp. 25-32, 1996.

[20] Mungra A., van Bokhoven S. C., Florie J., van Kanten R. W., van Roosmalen J., and Kanhai H. H. (1998 Mar). Reproductive age mortality survey to study under-reporting of maternal mortality in Surinam. Eur J Obstet Gynecol Reprod Biol.(1), 77, 37-9.