



Levels and Correlates of Self-reported Maternal Morbidity in Women in a Community outreach area of a Teaching Hospital in Bihar

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Abstract

Background: Globally, maternal mortality ratio (MMR) dropped from 385 maternal deaths per 100,000 live births in 1990 to 216 in 2015, a 44% reduction. Despite substantial progress, maternal mortality still remains a matter of great public health importance. Maternal mortality indicates only the tip of the iceberg. For each woman who dies as the direct or indirect result of pregnancy, many more women experience life-threatening complications. Consistent with the higher rates of maternal mortality in LMICs, maternal morbidity rates are also higher in LMICs than HICs.

Objectives: The objectives of the study was to estimate the levels and correlates of self-reported maternal morbidity. The data was entered in Microsoft Excel and exported and analyzed in SPSS (v19.0). Descriptive statistics, bivariate and multivariate analysis were used to arrive at the conclusions in the study.

Methodology: This was a cross-sectional study on Maternal Morbidity using self reports without clinical examinations among women living in the community being served by MGM Medical College and LSK Hospital, Kishanganj, Bihar. The sample size of the study was calculated as 200 considering the prevalence of maternal morbidity in the state and after considering the possibility of nonresponse to the study.

Results: The prevalence of antenatal morbidity was found to be 23.5%, morbidity during labor was 16.5% while post partum morbidity was 25.5%. The overall maternal morbidity was 44.5%. Religion, occupation, past history of ailments, decision taking obtaining healthcare, access to pocket money, type of past delivery, type of last delivery, wantedness of the index pregnancy, food intake during the antenatal period, physical activity during the antenatal period and awareness of danger signs of pregnancy came out as significant correlates of maternal morbidity in the bivariate analysis. Finally food intake and physical activity during the antenatal period, awareness of danger signs of pregnancy and type of last delivery came out as significant correlates of maternal morbidity in the multivariate analysis.

Conclusion: It is evident from the findings of the study that the causes of maternal morbidity are deeply entrenched in the sociocultural milieu. The findings bring out the socio-economic context in which the women suffer from maternal morbidity and stresses on the importance of self-reported community based studies on maternal morbidity to understand the social determinants of maternal morbidity more and thus come up with plausible solutions.

Keywords: Maternal morbidity; Women's autonomy; Antenatal; Labor; Post partum; Correlates.

Introduction

Maternal mortality is a sentinel event used globally as a benchmark to monitor maternal health, the overall quality of reproductive health care, and the progress countries have made toward international development goals¹

Globally, maternal mortality ratio (MMR) dropped from 385 maternal deaths per 100,000 live births in 1990 to 216 in 2015, a 44% reduction²

Though most of the high income countries (HICs) as defined by the World Bank have consistently shown a decline in the Maternal Mortality Rates over the last 25 years, low and middle income countries (LMICs)* still bear 99% of the burden of maternal mortality.³ A Sustainable Development Goal for 2030 is to reduce the global MMR to 70 per 100,000 live births and for no country to exceed two times that ratio (140 per 100,000 live births).⁴

Despite substantial progress, maternal mortality still remains a matter of great public health importance. Maternal mortality indicates only the tip of the iceberg. For each woman who dies as the direct or indirect result of pregnancy, many more women experience life-threatening complications.^{5,6} Consistent with the higher rates of maternal mortality in LMICs, maternal morbidity rates are also higher in LMICs than HICs.⁷

The International Classification of Diseases (ICD-10) defines maternal death as “[The] death of a woman while pregnant or within 42 days of the end 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”⁸

India has made great strides in maternal health over the past several decades, reducing its maternal mortality ratio (MMR) from 556 to 174 maternal deaths per 100,000 live births between 1990 and 2015 (World Bank 2016a). With this progress, India came closer to achieving United Nations (UN) Millennium Development Target 5A, reducing its MMR by 75 percent by 2015

(World Bank 2016a; World Health Organization 2015).

This progress is largely attributed to the policies and initiatives to increase access to maternal health services. However, the rate of improvement has slowed down, with large disparities existing between states and across populations and the country continues to contribute almost one-quarter of maternal deaths globally. Added to this, India also accounts for a high but difficult to measure rate of so-called near-miss maternal deaths that often lead to maternal morbidity.⁹

Although the incidence of maternal morbidity in India is largely unknown due to the country’s lack of diagnoses and under-reporting, it is estimated that millions of Indian women experience pregnancy-related morbidity. As part of the Global Burden of Disease estimates, India contributes to one-fifth of the disability-adjusted life years lost globally due to maternal health conditions (World Health Organization 2008). These suggest there is still progress to be made in maternal health in India.¹⁰

MMR is particularly high in India’s northern states, where its poorest and most marginalized populations reside. At the same time, MMR in many wealthier states, where access to care is better, also remain above the country’s goals; only Maharashtra and Kerala have an MMR below 70 (United Nations 2016) per 100,000 live births.

The state of Bihar registers a MMR of 208. (Maternal mortality ratio by state, 2013. Ministry of Health and Family Welfare 2015c).

Information on maternal morbidity is frequently collected from hospital settings, which represent only a section who seeks healthcare. Community-based studies are rare. Moreover, detailed knowledge on the levels of maternal mortality and morbidity and the causes of their occurrence does not exist.¹¹

Thus a better understanding of maternal morbidity, will lead to a lesser burden with framing of better policies and implementation of tailored services.¹²

Materials and Methods

This was a cross-sectional study on Maternal Morbidity using self-reports without clinical examinations among women living in the community being served by MGM Medical College and LSK Hospital, Kishanganj, Bihar.

The sample size of the study was calculated as 200 considering the prevalence of maternal mortality in the state and after considering the possibility of nonresponse to the study.

The selected criteria included women in the age group 15-49 years who delivered a live birth or a still birth or in whom the pregnancy terminated in abortion (spontaneous/induced) in the last 1 year from 1st June 2018 to 31st May 2019 and who were willing to participate. Study subjects were selected at random from the sample frame which included 356 women.

Ethical clearance was obtained from Institutional ethics committee.

The operational definition of maternal morbidity used in this study was adopted from the definition of maternal morbidity as coined by the Maternal Morbidity Working Group (MMWG) (WHO,2012) as “any health condition attributed to and/or aggravated by pregnancy and childbirth that has a negative impact on the woman’s wellbeing”.¹³

The dependent variable in the study was maternal morbidity. As per the standard practice protocol where in uncomplicated institutional deliveries with mother and baby keeping fine and the discharge being planned within 48 hours, hospitalization > 2 days and or blood transfusion or being bed ridden for > 24 hours or affecting the normal day to day activities of the woman like going to the toilet, bathing, eating were set as the different parameters for measuring maternal morbidity.

The correlates of maternal morbidity were assessed through different independent variables like the socioeconomic status of the women, history of ailments prior to the last (index) pregnancy, the women’s autonomy and decision making power measured by her ability to take

decisions regarding obtaining healthcare and access to pocket money, pregnancy history prior to the last (index) pregnancy, pregnancy history of the last (index) pregnancy, antenatal profile during the last (index) pregnancy, the woman’s healthcare seeking behavior and availability and quality of healthcare services.

SLI (Standard of Living Index) has been measured based on the NFHS-2 criteria with those with overall scores 0-14 being considered as hailing from low SLI, 15-24 as medium SLI and 25-67 as High SLI.

Standard definitions of Spontaneous abortion, Induced abortion, Antenatal period, Labour and Postpartum period were used in the study. To include the cases of late maternal morbidity, complaints of the women extending beyond six weeks (42 days) after delivery or termination of pregnancy to one year were included.

Date collection was done by visit to individual homes of study subjects using a pretested semi-structured questionnaire translated into the local dialect of Hindi.

The data was entered in Microsoft Excel and exported and analyzed in SPSS (v19.0). Descriptive statistics, bivariate and multivariate analysis were used to arrive at the conclusions in the study.

Results

Demographic profile of the participants

The Socio-economic profile of the study population is depicted in [Table 1]

Out of 200 women interviewed, 57.5% were Muslims and 42.5% Hindus. The study population belonging to the age group 15-19 years was 23.5%, while 43.5% belonged to the age group 20-24 years, 25 percent belonged to the age group 25-29 years, 5.5% belonged to the age group 30-34 years, 2 percent belonged to the age group 35-39 years and 0.5% belonged to the age group 40-44 years. There were no cases belonging to the age group 45-49 years. The mean age was 22.78 ±4.23 years. The range being 16 years to 42 years. The lowest age of first pregnancy among the cases

was as low as 15 years to as high as 30 years with the mean age being 18.93 ± 3.02 years.

More than half of the study population (50.5%) of the women did not have any formal education, while 24% had 1-5 years of schooling, 23% had 6-10 years of schooling, 1.5% had passed the 10+2 level, and only 1 percent had completed graduation. Majority of the study population were housewives while those who were occupied were mostly employed as housemaids, teachers and vegetable sellers.

All the 200 women interviewed were married and 95.5% were staying with their husbands while 2.5% had been deserted by their husbands. A very small proportion of the women (1%) were separated and the remaining 1 percent had their husbands working outside. As far as the husband's education status was concerned, 38.3% had no formal education, 27.5% had 1-5 years of schooling, 28.5% had 6-10 years of schooling, and 5.2% had passed 10+2 level while only 0.5% had completed graduation.

Of the study population, 38% belonged to the low SLI, majority (56.5%) belonged to medium SLI while only 5.5% belonged to the high SLI.

Of the study population, 85% had no history of ailments. 15% had past history of ailments like hypertension (3%), anemia (0.5%), TB (3.5%), malaria (2.5%), jaundice (2.5%), asthma (1.5%) and others like bloody diarrhea, rashes, worm infestation (1.5%). Of those cases who had past history of ailments, 76.7% sought healthcare for these ailments.

Women's Autonomy and Decision Making

Women's autonomy and decision making has been described using their decision making with regard to obtaining healthcare, their vulnerability to domestic violence and their access to independent resources by way of pocket money. This has been depicted in Table 2. Of the study population, 34% took decisions themselves regarding obtaining healthcare, 2.5% took decisions themselves along with their husband while majority (63.5%) of the women had no

power themselves to take decisions regarding obtaining healthcare. The study population having access to pocket money was 53.5% while 45.5% had no access to pocket money. Out of 200 women interviewed, 28.5% women complained of being beaten or physically mistreated in the last one year while 3.5% were unwilling to answer this question. Out of the women who complained of being beaten or physically mistreated in the last 1 year, 77.2% complained of being beaten a few times in the last 1 year while the rest complained of being beaten multiple times in the last 1 year.

[Table 2]

Women's Pregnancy History

The women's pregnancy history was described in terms of the number of pregnancies experienced, the various outcomes of these pregnancies in terms of live births, still births and abortions, the type of delivery of the index pregnancy and type of attendance at delivery. [Table 3] depicts this.

Pregnancy Related Care and Healthcare Seeking

The profile and nature of care taken by women during pregnancy in terms of nature and quality of antenatal visits, the wantedness status of the index pregnancy, the nature of food intake during pregnancy (same as before, reduced/increased) and awareness of the danger signs for which caution has to be exercised have all been described in [Table 4]

Morbidity Profile

As per the study, maternal morbidity during the antenatal period was found as 23.5%, during labour 16.5% and in the post partum period it was found to be 25.5%. The overall morbidity (any woman experiencing antenatal morbidity or morbidity during labour or post partum morbidity considered as having maternal morbidity) was found to be 44.5%.

This was low in comparison to studies done in other parts of India which could be due to the maternal healthcare services provided in this

community through the Medical College. It could also be that as the levels of awareness and education were poor among the women in the community, the self reported maternal morbidity was low.

The major complaints in the antenatal period included mostly severe pain abdomen (11.5%); severe vomiting (11.5%); pallor, fatigability, tingling, dizziness (10.5%); painful urination (8%); swelling of legs, body and face (8%); very high fever (6%) and malaria (4%).

The major complaints during labour included mostly prolonged labour > 18 hours (7%); excessive bleeding per vagina requiring blood transfusion (6%); severe pain abdomen (1.5%); retained placenta (3%); convulsions not from fever (1%) and very high fever (0.5%).

The major complaints during the post partum period included mostly wound pain (5.5%); pallor, fatigability, tingling, dizziness (5.5%); severe pain abdomen (10.5%); pain during vaginal intercourse (5%); painful urination (7%); very high fever (4.5%) and severe pain in the breast (2.5%).

In this study 97.5% of the women sought antenatal care though awareness about the danger signs was very low (14.5%) and 93.5% had institutional deliveries. This could be due to this community being served by the Medical College and also due to the constant touch of the women with the Medical College healthcare workers.

Correlates of Maternal Morbidity

Bivariate Analysis to find out associations between the outcome variable (maternal morbidity) and the other variables (determinants) and these are described in Table 1.

An association was found between religion and maternal morbidity (P value=0.000). Muslim women were found to have more maternal morbidity (OR:3.99; 95% CI 2.17-7.36). This could be due to the fact that majority of the Muslims hailed from low SLI families and were occupied which could have adversely affected their food intake and physical activity during the

antenatal period and resulted in more maternal morbidity.

Maternal morbidity was associated with occupation of the woman (P value= 0.023). Women who were employed were found to be suffering more from maternal morbidity (OR: 3.63; 95% CI 1.24-10.6). This could be due to the fact that women who were occupied also had to engage themselves in household activities which only increased the amount of their physical activity during the antenatal period.

Again there was an association between past history of ailments and maternal morbidity (P value=0.000) with women reporting past history of ailments having more maternal morbidity (OR: 5.18; 95% CI 2.10-12.74) than those without any past history of ailments. This is quite obvious from the fact that these women could have poor general health and so have more morbidity. It could also be that past ailments in these women gave rise to a better understanding of the danger signs of pregnancy (through prior contact with the health system) and so the perceived morbidity (self reported morbidity was higher in them).

Women's decision taking regarding obtaining healthcare was associated with maternal morbidity (P value=0.005) with women who do not have any say in taking decisions regarding obtaining healthcare experiencing more maternal morbidity than women who take decisions regarding obtaining healthcare themselves (OR: 2.35; 95% CI 1.29-4.30). This could be due to the fact that women who have no say in taking decisions regarding obtaining healthcare seek healthcare late and thus have more morbidity. These women also had less access to food intake during the antenatal period which explains their higher morbidity. It is also true that these women who have no say in taking decisions regarding obtaining healthcare had more of unwanted pregnancies which can also increase the maternal morbidity in them.

There was an association found between access to pocket money and maternal morbidity (P value=0.001) with women having more pocket

money experiencing more maternal morbidity than those women who lack pocket money (OR: 2.82; 95% CI 1.58-5.04). There was no association found between having pocket money and decision taking regarding obtaining healthcare. Ironically, unwanted pregnancies were more in women who had access to pocket money and these women also had their amount of physical activity unchanged or increased during the antenatal period. With only 9% of the population employed but 53.5% having access to pocket money, it can be concluded that the pocket money came from the earnings of their spouses but it did not necessarily mean that women with more access to pocket money will have more autonomy.

Maternal morbidity was also strongly associated with the type of past deliveries (P value=0.000). Women who had past history of cesarean section all experienced a repeat cesarean section or underwent normal delivery with interventions. There is also a probability that these women also have poor general health status and thus experience more morbidity. There was an association between type of last delivery and maternal morbidity (P value=0.002) as well with women delivering by cesarean section or normal delivery with interventions like episiotomy or forceps having much higher maternal morbidity than others (OR:2.66; 95% CI 1.46-4.84).

The wantedness status of the index pregnancy was found to be associated with maternal morbidity (P value=0.000) with those in whom the pregnancy is not wanted reporting higher morbidity than those in whom the pregnancy is wanted (OR: 3.69; 95% CI 2.05-6.63). This could be explained from the fact that as these women did not want the pregnancy they were reluctant to take care of their own health which could have resulted in more morbidity. It could also be that as these women did not want the pregnancy, the perceived morbidity (self-reported morbidity) was high in them.

Food intake during the antenatal period was associated with maternal morbidity (P

value=0.002) with women in whom food intake during the antenatal period reduced experiencing more morbidity than those women in whom the food intake during the antenatal period increased or remained unchanged (OR: 2.52; 95% CI 1.40-4.54). Physical activity was also associated with more of maternal morbidity (P value=0.000) with women in whom physical activity increased or remained unchanged experiencing more morbidity than those women in whom the physical activity reduced (OR: 3.13; 95% CI 1.74-5.63).

Awareness about the danger signs of pregnancy was found to be associated with maternal morbidity (P value=0.000) with those aware of the danger signs of pregnancy experiencing more morbidity than those who are ignorant about it (OR: 4.88; 95% CI 1.98-12.05). It is quite obvious that these women who are more aware of the danger signs of pregnancy will have more of perceived (self-reported) morbidity. As has been mentioned earlier, these women could have more of past history of ailments and poor general health status which could result in more morbidity.

Perceived availability of medicines in the health facility was found to be associated with maternal morbidity (P value=0.019) with non availability of medicines being associated with more maternal morbidity (OR: 3.09; 95% CI 1.17-8.14). The non availability of medicines at the health facility during delivery was associated with more of postpartum morbidity (P value=0.027). Behavior of the staff at the health facility was also found to be associated with maternal morbidity (P value=0.046) with bad behavior of the health facility staff associated with more maternal morbidity (OR: 2.32; 95% CI 1.04-5.20). Though there was no association between bad behavior of the staff at the health facility and postpartum morbidity per se, there was an association between bad behavior of the staff at the health facility and post partum healthcare seeking (P value=0.047). It could thus be that women who were treated badly by the staff at the healthcare facility during delivery did not seek healthcare at

the health facility in the postnatal period and so experienced more maternal morbidity.

Multivariate analysis using logistic regression

In the preliminary analysis it was seen that some of the variables were strongly associated with maternal morbidity. The dependent variable considered here was discrete, categorical, with women as having either experienced maternal morbidity or not having experienced it. Therefore binary logistic regression was the obvious choice for multivariate analysis. However, for deciding on a multivariate model, all of the variables found to have significant association with maternal morbidity cannot be used because the number of classifications that would be then formed would be very high so as to render the analysis invalid. This analysis to develop a restricted model was undertaken using a series of chi-squares across various intermediate variables known to be associated. The various chi-squares describing the associations are included in [Table 6].

Socio-economic factors including religion was found to be associated with woman's autonomy measured by decision making power regarding obtaining own healthcare and access to pocket money. Socio-economic factors like religion and occupation were directly associated with maternal morbidity and in turn were themselves associated (SLI with occupation, SLI with education, education with occupation). Socio-economic status was also associated with food intake during the antenatal period (SLI, religion and food intake) and physical activity during antenatal period (occupation, education, religion with physical activity). Given that socio-economic status strongly determines women's autonomy, food intake and physical activity during the antenatal period, in the final analysis these variables (women's autonomy, food intake and physical activity in the antenatal period) that are more proximate determinants of maternal morbidity were considered.

Among women's autonomy variables, decision making power regarding obtaining healthcare and

pocket money were strongly associated with maternal morbidity and no association was found between these two. However, decision making power regarding obtaining healthcare and pocket money had a strong association with food intake and physical activity during the antenatal period and also awareness of the danger signs. Thus food intake and physical activity during the antenatal period and also awareness of danger signs are shaped by the women's socio-economic status and autonomy. For further analysis of maternal morbidity, it was therefore possible to consider food intake and physical activity during antenatal period and awareness of danger signs as proxies for women's autonomy.

The past history of ailments was associated with awareness of danger signs and wantedness of the last pregnancy. It is possible that the past history of ailments gave rise to a better understanding of the danger signs of pregnancy. Further, the wantedness of the last pregnancy ie whether a woman chose to become pregnant with the last pregnancy or not is related somewhat to her physical well being. Therefore, we eliminated both past history of ailments and wantedness of the last pregnancy from the analysis with respect to maternal morbidity. Thus awareness of danger signs was taken as a proxy for the past history of ailments and wantedness of the last pregnancy.

Many of the proximate determinants were strongly associated with the type of last delivery and some with the type of past delivery. But type of last delivery is strongly determined by type of past delivery. Therefore food intake and physical activity during antenatal period, awareness of danger signs and type of last delivery were retained for the final analysis as in [Table 7].

The proportion of cases correctly predicted by the model is 76.4%.

From this model it is evident that food intake during antenatal period is associated with maternal morbidity (P value=0.007) with women in whom food intake during the antenatal period reduced experiencing more morbidity than those women in whom the food intake during the

antenatal period increased or remained unchanged (OR: 2.42; 95% CI 1.27-4.58). Physical activity during the antenatal period is also associated with more of maternal morbidity (P value=0.001) with women in whom physical activity increased or remained unchanged experiencing more morbidity than those women in whom the physical activity reduced (OR: 3.01; 95% CI 1.72-6.74).

Awareness about the danger signs of pregnancy was found to be associated with maternal morbidity (P value=0.011) with those aware of the danger signs of pregnancy experiencing more morbidity than those who were ignorant about it (OR:3.42; 95% CI 1.35-8.82). The association between type of last delivery by cesarean section or normal delivery with interventions like episiotomy or forceps having much higher maternal morbidity than others (OR: 2.55; 95% CI 1.33-4.89).

Table 1: Socio-economic profile of the study population

Religion	
Muslims	57.5%
Hindus	42.5%
Education of the Women	
No formal education	50.5%
1-5 years of schooling	24.0%
6-10 years of schooling	23.0%
10+2 level	1.5%
Graduation complete	1.0%
Occupation of the Women	
Housewife	91.0%
Employed	9.0%
Marital Status of the Women	
Married and stays with Husband	95.5%
Married but separated	1.0%
Married but deserted	2.5%
Married but husband works elsewhere	1.0%
Education of the Husband	
No formal education	38.3%
1-5 years of schooling	27.5%
6-10 years of schooling	28.5%
10+2 level	5.2%
Graduation complete	0.5%
SLI(Standard of Living Index)	
Low	38.0%
Medium	56.5%
High	5.5%
Ailments prior to last pregnancy	
No ailments	85.0%
Hypertension	3.0%
Anemia	0.5%
Asthma	1.5%
Tuberculosis	3.5%
Malaria	2.5%
Jaundice	2.5%
Others	1.5%
Healthcare seeking by the woman for the past ailments (15% or 30 women had past history of ailments)	
Yes	
No	76.7%
	23.3%

Table 2: Autonomy and decision making power of the study population

	Decision regarding obtaining healthcare
Herself	34%
Herself with someone	2.5%
Others	63.5%
	Access to pocket money
Yes	53.5%
No	46.5%
	Beaten or mistreated physically
Yes	28.5%
No	68.0%
Not willing to answer	3.5%
	Beaten by whom (57 cases gave history of being beaten)
Husband	89.5%
Husband, Mother-in-law, Sister-in-law	3.5%
Mother	7.0%
	Frequency of being beaten in the last 1 year
A few times	77.2%
Many times	22.8%

Table 3: Distribution of the Pregnancy history of the study population

	Past Pregnancy outcomes
Not applicable	38.0%
Live birth	49.5%
Abortion or Still Birth	11.5%
Abortion and Still Birth	1.0%
	Past modes of Delivery
Not applicable	
Normal delivery	
Caesarean	
	No. of pregnancies experienced to date
1-2 pregnancies	72.5%
3- 4 pregnancies	20.5%
4-7 pregnancies	7.0%
	Place of last (index) delivery
Home	6.6%
Private Nursing home	4.0%
Government hospital	7.1%
MGM Medical College and LSK Hospital	82.3%
	Person attending the last (index) delivery
Dai	6.6%
Doctor	81.8%
Doctor, Nurse	5.0%
Nurse	6.6%

Table 4: Antenatal profile and availability of maternal healthcare services of the study population

	Wantedness status of the last (index) pregnancy
Yes	54.5%
No	45.5%
	Amount of Physical Activity during Antenatal Period
Amount reduced	45.5%
Amount remained unchanged	48.0%
Amount increased	6.5%
	Awareness of Danger Signs
Yes	14.5%
No	85.5%
	Healthworker's visit in the antenatal period
Yes	94.5%
No	5.5%
	Frequency of visit in the Antenatal period
Once in every week	18.5%
Once in every two weeks	37.0%
Once in every month	39.0%
No	5.5%
	Healthcare worker's visit in the postnatal period
Yes	96.5%
No	3.5%
	Frequency of visit in the postnatal period
Once in every week	18.0%
Once in every two weeks	40.5%
Once in every month	38.0%
No	3.5%
	Distance of the nearest health facility from the women's home
<1 Km	65.5%
1-<2 Kms	28.5%
2-5 Kms	3.5%
>5 Kms	2.5%
	Nature of Services in the Nearest Health Facility
Doctor, private, qualified	7.5%
Doctor, private, unqualified	2.5%
MGM Medical College & Hospital Doctor and Health worker	84.5%
Government Hospital	5.5%
	Waiting time at the health facility (if woman experienced hospitalization during last delivery)
<15 mins	77.5%
15 mins-<1/2 hrs	20.9%
1/2 hrs and more	1.6%
	Problems faced in seeking healthcare (if the woman experienced hospitalization during the last delivery)
Yes	10.7%
No	89.3%
	Perceived availability of medicines in the health facility (if the woman experienced hospitalization during the last delivery)
Yes	13.4%
No	86.6%
	Behavior of staff at the Health Facility (if woman experienced hospitalization during the last delivery)
Good	84%
Bad	16%
	Satisfaction with overall care at health facility (if woman experienced hospitalization during the last delivery)
Yes	94.1%
No	5.9%

Table 5: Correlates of maternal morbidity in the study population

Correlates		Overall Maternal Morbidity		Total	X ² (p value)
		Yes	No		
Religion	Muslims	67	48	115	
	Hindus	22	63	85	0.000
Total		89	111	200	
Age Group	15-19 yrs	17	30	47	
	20-24 yrs	38	49	87	
	25-29 yrs	22	28	50	
	30 yrs and above	12	4	16	0.061
Total		89	111	200	
Education of the woman	Yes	44	55	99	
	No	45	56	101	1.000
Total		89	111	200	
Occupation of the woman	Yes	13	5	18	
	No	76	106	182	0.023
Total		89	111	200	
Marital status	Married and stays with husband	84	107	191	
	Separated/Deserted/Husband works elsewhere	5	4	9	0.515
Total		89	111	200	
Education of Husband	Yes	47	72	119	
	No	38	36	74	0.136
Total		85	108	193	
Age of first pregnancy	<21 yrs	64	89	153	
	21 yrs and above	25	22	47	0.183
Total		89	111	200	
Past History of ailments	Yes	23	7	30	
	No	66	104	170	0.000
Total		89	111	200	
SLI	Low	31	45	76	
	Medium and High	58	66	124	0.382
Total		89	111		
Decision taking regarding own healthcare	Woman herself involved	23	50	73	
	Others totally	66	61	127	0.005
Total		89	111	200	
Access to pocket money	Yes	60	47	107	
	No	29	64	93	0.001
Total		89	111	200	

Beaten or physically mistreated in the last 1 year	Yes	29	28	57	
	No	56	80		
Total				136	0.266
		85	108	193	
Outcome of past pregnancies (History of abortion/stillbirth)	Yes	14	11	25	
	No	44	55	99	0.371
Total		58	66	124	
Type of past deliveries (History of Cesarean section)	Yes	20	0	20	
	No	36	63	99	0.000
Total		56	63	119	
No. of pregnancies experienced to date	1 and 3 or more	61	70	131	
	2	28	41	69	0.456
Total		89	111	200	
Spacing between the last pregnancy and the pregnancy before that	<2 yrs	18	12	30	
	2 yrs and above	40	54	94	0.141
Total		58	66	124	
Type of last delivery	Cesarean/normal with interventions	63	56	119	
	Normal without interventions	24	55	79	0.002
Total		87	111	198	
Place of last delivery	Home	3	10	13	
	Nursing home, Government hospital, MGM Medical College	84	101	185	0.152
Total		87	111	198	
Person who attended the delivery (Skilled attendant)	Yes	84	101	185	
	No	3	10	13	0.152
		87	111	198	
Wantedness of the pregnancy	Yes	33	76	109	
	No	56	35	91	0.000
		89	111	200	

Amount of food intake during antenatal period	Amount increased/Unchanged	45	80	125	
	Amount reduced	44	31	75	0.002
		89	111	200	
Amount of physical activity during antenatal period	Amount reduced	27	64	91	
	Amount remained unchanged/increased	62	47	109	0.000
Total		89	111	200	
Awareness about danger signs	Yes	22	7	29	
	No	67	104	171	0.000
Total		89	111	200	
Healthworker's visit in the antenatal period	Yes	84	105	189	
	No	5	6	11	1.000
Total		89	111	200	
Nearest Health Facility	< 2 kms	87	101	188	
	2 Kms and above	2	10	12	0.069
Total		89	111	200	
Healthworker's visit in the postnatal period	Yes	85	108	193	
	No	4	3	7	0.702
Total		89	111	200	
Waiting time at the health facility	<15 mins	70	75	145	
	15 mins and above	16	26	42	0.293
Total		86	101	187	
Problems faced in getting care	Yes	11	9	20	
	No	75	92	167	0.479
Total		86	101	187	
Reported availability of medicines at the Health facility	Yes	6	19	25	
	No	80	82	162	0.019
Total		86	101	187	
Behaviour of the staff	Good	67	90	157	
	Bad	19	11	30	0.046
Total		86	101	187	
Satisfaction with overall healthcare	Yes	81	95	176	
	No	5	6	11	1.000
Total		86	101	187	

Table 6: Calculations of associations for deciding on the Multivariate Model

Determinants	Determinants	X2 value	p-value	
Decision making regarding obtaining healthcare	Religion	0.093	0.769	
	Education of the woman	0.848	0.381	
	Occupation of the woman	14.541	0.000	
	Past history of ailments	1.472	0.304	
	SLI	0.111	0.765	
	Amount of food intake during antenatal period	5.894	0.052	
	Amount of physical activity during anetnatal period	9.813	0.007	
	Wantedness status of the last pregnancy	9.078	0.003	
	Access to pocket money	Religion	7.384	0.010
		Education of the woman	0.075	0.887
Occupation of the woman		9.958	0.002	
Past history of ailments		0.142	0.843	
SLI		1.96	0.190	
Amount of food intake during antenatal period		2.223	0.329	
Amount of physical activity during anetnatal period		185.244	0.000	
Wantedness status of the last pregnancy		5.604	0.023	
Decision making regarding obtaining healthcare		Access to pocket money	0.077	0.883
		Education of the woman	16.831	0.000
SLI	Occupation of the woman	6.628	0.020	
Education of the woman	Occupation of the woman	8.530	0.005	
Amount of food intake during antenatal period	Religion	6.876	0.012	
	Education of the woman	0.108	0.772	
	Occupation of the woman	1.319	0.309	
	Past history of ailments	2.353	0.153	
	SLI	3.380	0.073	
Amount of physical activity during antenatal period	Religion	9.255	0.010	
	Education of the woman	6.477	0.039	
	Occupation of the woman	141.119	0.000	
	Past history of ailments	0.431	0.556	
	SLI	3.717	0.156	
Awareness of danger signs	Religion	14.351	0.000	
	Education of the woman	8.728	0.004	
	Occupation of the woman	88.290	0.000	
	Past history of ailments	0.574	0.537	
	SLI	10.098	0.004	
	Decision making power regarding obtaining own healthcare	7.161	0.008	

	Access to pocket money	5.477	0.041
	Type of past delivery	10.350	0.004
	Type of last delivery	5.591	0.061
Past history of ailments	Religion	1.214	0.320
	Education of the woman	3.690	0.740
	Occupation of the woman	0.430	0.738
	SLI	0.500	1.000
	Wantedness status of the last pregnancy	4.526	0.046
	Type of last delivery	2.426	0.297
Type of past delivery	Type of last delivery	66.709	0.000
	Religion	0.081	1.000
	Education of the woman	0.014	1.000
	Occupation of the woman	6.003	0.020
	SLI	0.134	0.807
	Past history of ailments	0.092	0.752
	Decision making power regarding obtaining own healthcare	0.933	0.454
	Access to pocket money	1.623	0.226
	Wantedness status of the last pregnancy	2.294	0.147
	Amount of food intake during antenatal period	1.268	0.530
	Amount of physical activity during antenatal period	9.686	0.008
Type of last delivery	Religion	0.402	0.818
	Education of the woman	4.113	0.115
	Occupation of the woman	4.123	0.116
	SLI	1.517	0.468
	Past history of ailments	2.426	0.297
	Decision making power regarding obtaining own healthcare	4.844	0.089
	Access to pocket money	8.000	0.018
	Wantedness status of the last pregnancy	9.164	0.010
	Amount of food intake during antenatal period	9.512	0.050
	Amount of physical activity during anetnatal period	11.214	0.024
Behaviour of staff at health facility	SLI	1.938	0.281
	Religion	8.255	0.005
	Education of the woman	4.099	0.048
	Occupation of the woman	0.006	1.000
	Type of last delivery	0.818	0.516
	Type of past delivery	0.439	0.541
	Past history of ailments	2.288	0.155
	Healthcare seeking in the postpartum period	13.347	0.038
Perceived availability of medicines	SLI	5.948	0.025
	Religion	0.174	0.829
	Education of the woman	7.965	0.005
	Occupation of the woman	0.088	1.000
	Type of last delivery	4.325	0.038
	Type of past delivery	10.413	0.003
	Postpartum morbidity	4.945	0.027
	Past history of ailments	4.870	0.028

Table 7: Multivariate analysis of self-reported maternal morbidity by food intake, physical activity during antenatal period, awareness of danger signs and type of last delivery

Determinants	B	p value	OR	95% CI for OR
Food intake during antenatal period*	0.882	0.007	2.42	1.27-4.58
Physical activity during antenata period**	1.103	0.001	3.01	1.72-6.47
Awareness of danger signs***	1.23	0.011	3.42	1.33-8.82
Type of last delivery****	0.953	0.005	2.55	1.33-4.89

*Taking food intake reduced during antenatal period as reference category.

**Taking physical activity unchanged or increased during antenatal period as reference category.

***Taking awareness of danger signs present as reference category.

****Taking Cesarean sections/normal delivery but with interventions as reference category.

Discussions

Prevalence of Maternal Morbidity

The burden of maternal morbidity was high. Some of the Indian studies found maternal morbidity rates higher than this study. This could be due to the fact that a medical college was providing a basket of maternal healthcare services in this community, it could also be that as the levels of awareness and education among the women were poor, the self reported maternal morbidity was low.

Though the prevalence of the complaints varied among the studies in many instances, complaints during the antenatal, during labour and during the post partum period reported by the women in this study were quite similar as reported in other studies.

Healthcare seeking behavior

The rates of healthcare utilization were quite high in this study which could be due to the access and proximity of this community to the medical college. It also brought out the fairly high rates of utilization of the private sector for seeking healthcare.

Correlates of Maternal Morbidity

The correlates of maternal morbidity as was evident from this study were in conformity with other studies. In this study, religion (Muslim); lack of decision making power regarding obtaining healthcare; past history of ailments; past history of Cesarean sections; deliveries by Cesarean section or normal deliveries with interventions like episiotomies or forceps; reduced food intake and increased physical activity during

antenatal period; awareness about the danger signs of pregnancy and wantedness status of the index pregnancy was associated with maternal morbidity. Religion was related to the lack of decision making power regarding obtaining healthcare in a society where there is female subjugation by the men folk and other elders. Past history of ailments was associated with maternal morbidity. Whether the pregnancy was wanted or not, reduced food intake and manual labour into late pregnancy were associated with adverse maternal outcomes. Like the findings in this study, awareness about danger signs of pregnancy was also associated with more of reported maternal morbidity. However, unlike this study, women's decision making power regarding obtaining healthcare was found to be associated with more maternal morbidity.

The correlates of maternal morbidity as was evident from this study were in conformity with other studies. In addition the relatively low levels of autonomy and lack of knowledge about the physiological matters related to pregnancy result in higher levels of physical activities during pregnancy. Further, women's lack of awareness about the danger signs during pregnancy may also contribute to maternal morbidity.

While use of the healthcare services provided by the Medical College for antenatal care and delivery is high, yet for minor pregnancy related problems the use of private practitioners is resorted to. This is due to the easy availability of the private practitioners at all times. But the community trusts the health workers and the doctors of the Medical College and this opportunity can be used to improve their

healthcare seeking and change beliefs that are detrimental to women's wellbeing.

This study did not find any association between the SLI and women's education and maternal morbidity. This could however be explained from the fact that there was not much variation in the Socio-economic status or education of the women as they all hailed from the same locality.

Physical violence during the last 1 year prior to delivery was found to be associated with adverse maternal outcomes in some studies. However, this was not revealed in our study. This could be due to the fact that this was a sensitive issue in the cultural context of the region, women refused to answer to this question and women who reported no physical violence in the last 1 year prior to delivery did not report correctly.

It is evident from the findings of the study that the causes of maternal morbidity are deeply entrenched in the sociocultural milieu. The findings bring out the socio-economic context in which the women suffer from maternal morbidity and stresses on the importance of self-reported community based studies on maternal morbidity to understand the social determinants of maternal morbidity more and thus come up with plausible solutions.

Conclusions

The burden of maternal morbidity is high particularly the post partum morbidity. In addition the relatively low levels of autonomy and lack of knowledge about the physiological matters related to pregnancy result in higher levels of physical activities during pregnancy. Further, women's lack of awareness about the danger signs during pregnancy may also contribute to maternal morbidity.

While use of the healthcare services provided by the Medical College for antenatal care and delivery is high, yet for minor pregnancy related problems the use of private practitioners is resorted to. This is due to the easy availability of the private practitioners at all times. But the community trusts the health workers and the

doctors of the Medical College and this opportunity can be used to improve their healthcare seeking and change beliefs that are detrimental to women's wellbeing.

Limitations

The study was based on self reported maternal morbidity which relies on women's perceptions about maternal morbidity. Thus there is always a chance of over or underreporting of maternal morbidity.

The sample of this study was drawn from women who delivered within 1st June 2018 to 31st May 2019. As the data collection started from July 2018, the recall period for many participants was about a year leading to the chance of recall bias.

This is a cross sectional study, so that temporality of many associations that were significant could have been lost.

The study was undertaken in the community being served by the Medical College providing good access to maternal healthcare services. So, generalizability of the study in other areas is questionable.

Nevertheless, in the absence of any published data on maternal morbidity from the State, this study was an earnest endeavor by the study team to throw some light on the study topic and thus come up with recommendations aimed towards improving the health of the mothers.

Conflict of Interest

The authors declare there is no conflict of interest in doing the study.

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