

Analysis of maternal mortality in Jammu and Kashmir: A retrospective study based on review of field data



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Submission: 11-12-2021

Revision: 04-03-2022

Publication: 01-04-2022

ABSTRACT

Background: The inequities in provision of essential maternal healthcare have led to significant difference in maternal mortality globally. Having area specific data of maternal deaths are an important prerequisite for strengthening of reproductive and maternal health services.

Aims and Objectives: The present study was conducted to estimate maternal mortality ratio (MMR) for J&K and describe the epidemiological characteristics of maternal deaths.

Materials and Methods: Data regarding maternal deaths and live birth from April 2020 to March 2021 were collected. Data for maternal deaths were analyzed with respect to epidemiological parameters. MMR and lifetime risk were calculated using standard formulas. **Results:** A total of 91 maternal deaths were reported in the same period. It translated to an MMR of 46 for J&K. The mean age at death was 28.6 years \pm 5.57. Primigravidae constituted 41.8% of deaths and most deaths (72.5%) had happened in post-natal period. Most of the deaths (78/91) had happened at tertiary level healthcare facilities with two facilities (LD Hospital, Srinagar & SMGS Hospital Jammu) reporting (52/91) of the deaths. Deaths during transit contributed to 5% of total deaths. Eclampsia and post-partum hemorrhage were the most common causes of death and contributed to around 50% of deaths. **Conclusion:** The maternal mortality rate was estimated to be 46 with wide inter district variations. PPH and Eclampsia were the most common causes with most deaths happening within tertiary care hospitals.

Key words: Maternal mortality; Maternal health; Obstetrics; Postpartum hemorrhage; Eclampsia

Access this article online

Website:

<http://nepjol.info/index.php/AJMS>

DOI: 10.3126/ajms.v13i4.41351

E-ISSN: 2091-0576

P-ISSN: 2467-9100

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INTRODUCTION

The resilience of health systems in any area is determined to a large extent by the coverage and quality of services it can provide to the vulnerable sections of the population.^{1,2} Pregnant women and newborns are one of the vulnerable sections, and huge inequities exist in their mortality rates between different nations and even between different sections of the society within the same country.^{3,4} Maternal mortality ratio (MMR) is an important outcome indicator for reproductive and maternal health services and has been the focus of multiple international and national commitments.^{5,6} Reduction in maternal mortality was included in millennium development goals and has also

been included in sustainable development goals (SDGs). Target no 3.1 of SDGs aspires to achieve an MMR of < 70 at global level.⁷

As per the World Health Organization, “Maternal death is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.”⁸

Globally around 295,000 maternal deaths happen every year, with a maximum chunk of these being contributed by low- and middle-income countries. Sub-Saharan Africa and southern Asia accounted for approximately 86% (254,000)

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of estimated global maternal deaths.^{3,9} The inequities are so stark that a pregnant woman in West Africa has a 1 in 28 lifetime risk of maternal death in comparison to 1 in 12,000 for western Europe.^{5,10} The lifetime risk of maternal death in India is 3 in 1000.¹¹

India contributes to an estimated 26 thousand maternal deaths annually with an estimated MMR of 113.^{11,12} India has seen a significant decrease in the number of maternal deaths from the turn of this century. The decrease of MMR from the previous estimated value of 130 (2016 Sample Registration System [SRS]) to 113 (2018 SRS) translates to 2500 additional mothers saved annually.¹³ Large scale inequities also exist within the sub regions and states of India with MMR ranging from 43 in Kerala to 215 in Assam.¹¹

As MMR of an area acts as an outcome indicator for reproductive and maternal health services, it is imperative to have accurate national as well as subnational estimates for the same.¹⁴ In India the Office of the Registrar General provides estimates on MMR using the SRS.¹¹ The SRS provides national estimates, but subnational estimates are provided for only bigger states. This is done as estimation of MMR with a high precision needs a large sample size.

Aims and objectives

Considering the fact that there are no local estimates available for MMR for the UT of J&K, the present study was conducted to estimate the MMR in J&K for the year 2020 and to provide an epidemiological description of maternal deaths.

MATERIALS AND METHODS

Study design and setting

The study was conducted in all the districts of J&K. J&K lies in the northern part of India with an estimated population of 13.7 million. Figure 1 depicts the study area within India. The state has a crude birth rate of 14.9 birth

per thousand population in comparison to 19.7 at national level.¹¹ Total fertility rate (TFR) of the area is 1.4 which is much less than TFR of 2 at national level. As per the latest SRS, infant mortality rate (IMR) of J&K is 20, which is less than national IMR of 30 (both sets estimated using the same methods). This study area also has higher coverage for other key maternal health indicators such as institutional delivery rate and immunization coverage for children.¹¹

Study participants

All maternal deaths that had happened in the study area from April 2020 to Mar 2021 were included in the study excluding deaths from accidental and incidental causes. Standard case definition was used for inclusion in the study.

Data collection

Data were collected by frontline workers (ANM posted at subcenters with the help of ASHA workers). One nodal person from each district was trained by the authors on the methodology and the study tool. The trained nodal persons then oriented one ANM from each subcenter area in the district. The ANM then conducted record reviews at their subcenter. To identify deaths that may have gone unrecorded in subcenter records, the ANMs then interviewed key stakeholders in their respective areas. The key stakeholder interviews were conducted with all the ASHA workers, village heads, local teachers, and religious leaders. Maternal deaths identified from both sources were entered in the standard format developed by authors. A maternal death was defined as “The death of a woman while pregnant, or within 42 days of termination of pregnancy, irrespective of the duration, and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management (from direct or indirect obstetric death), but not from accidental or incidental causes.”

The data collection instrument was developed by authors using the national MDSR guidelines as a reference and was used for data collection in households who had a maternal



Figure 1: Depicting the study setting

death in 1 year preceding the study.¹⁵ The data collection schedule collected information related to demographics, risk factors, education level, relevant obstetric history, place of delivery (if applicable), place of death, and noted any cause of death mentioned in records (If available). The data collection schedule was pretested on ten households to check for consistency and necessary changes were made after being reviewed by three experts for face and construct validity.

Statistical methods

Data were entered and analyzed on excel. Data were summarized as means and percentages. MMR was calculated using standard formulas.

MMR

MMR was derived as the proportion of maternal deaths per lakh live births. No of maternal deaths was obtained from field surveys by frontline workers and compiled for each district. Live births for the same area were obtained from the health management information system, which is a portal in which all maternal and child health indicators are uploaded by the facilities.^{3,7} It records more than 99% of the births in J&K.

Life time risk of maternal death

Lifetime risk for was calculated from MMR from standard formula. Lifetime risk = $1 - (1 - \text{MMR}/100000)^{35.5}$

Ethical consideration

The study was approved by institutional review committee. Informed consent was taken from all the study respondents.

RESULTS

A total of 91 maternal deaths were reported during the study period. The number of live births reported for the same duration was 1.98 lakhs. It translates to an MMR of 46 (33.7–61.4) for the union territory of J&K. Table 1 presents district wise breakup for estimated number of deliveries, no of maternal deaths and the calculated MMR. MMR was highest for district Pulwama (110), followed by Poonch (104) and Baramulla (74).

The mean age at deaths was 28.6 years ± 5.57. The age distribution of deaths is depicted in Figure 2. Most of the maternal deaths 66 (72.5%) had happened in post-natal period and 38 (41.8%) were primigravidae. Of these deaths, 71 (78%) followed Islam as their religion and 76 (83.5%) had at least primary level education (Table 2).

The cause of maternal deaths is depicted in Figure 3. The most common cause of maternal deaths was postpartum hemorrhage (PPH) followed by Eclampsia, both of which

Table 1: District wise maternal mortality ratio in J&K

District name	Estimated no of deliveries	No of maternal deaths	MMR (95% CI)
1 Anantnag	17471	8	46 (33.7–61.4)
2 Budgam	12208	2	16 (9.1–25.9)
3 Bandipore	6353	2	31 (21–44)
4 Baramulla	16327	12	74 (58.1–92.9)
5 Doda	6639	1	15 (8.4–24.7)
6 Ganderbal	4818	1	21 (13–32)
7 Jammu	24780	9	36 (25.2–49.8)
8 Kathua	9984	1	10 (4.8–18.4)
9 Kishtwar	3736	1	27 (17.8–39.2)
10 Kulgam	6875	4	58 (44.04–74.98)
11 Kupwara	14097	6	43 (31.12–57.92)
12 Pulwama	9077	10	110 (90.41–132.6)
13 Poonch	7723	8	104 (84.9–126.1)
14 Rajouri	10405	7	67 (51.9–85.1)
15 Ramban	4595	3	65 (50.2–82.8)
16 Reasi	5096	2	39 (27.7–53.3)
17 Samba	5165	3	58 (44.1–74.9)
18 Shopian	4312	3	70 (54.6–88.4)
19 Srinagar	20032	0	0 (0–3.7)
20 Udhampur	8989	8	89 (71.5–109.3)
Total	198680	91	46 (33.7–61.4)

Table 2: No of maternal deaths segregated as per specific socio-demographic variables

Variable	n (%)
Total death recorded	No 91
Age (years)	Mean±SD 28.6 years±5.57
Religion	Muslim 71 (78%) Hindu 19 (20.9%) Sikh 1 (1.1%)
Education	Illiterate 15 (16.5%) Up to primary 24 (26.4%) Secondary 31 (34.1%) Graduate and more 21 (23.1%)
Caste	General 68 (74.72%) SC/ST 23 (25.28%)
Gravida	Primigravidae 38 (41.8%) Multigravida 53 (58.2%)
Period of death	Antenatal 21 (23.1%) Intra natal 4 (4.4%) Post-natal 66 (72.5%)

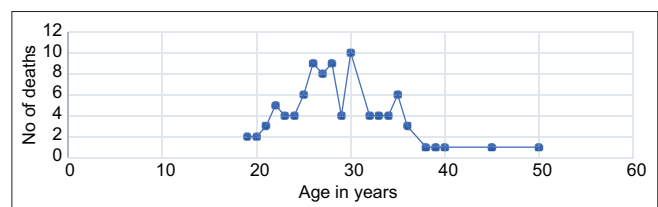


Figure 2: Age distribution of maternal deaths

contributed to 50% of deaths. Sepsis and ante-partum hemorrhage (APH) contributed to 20% of maternal deaths (Figure 3). Most of the deaths happened in tertiary level facilities with two hospitals reporting 52 (57.1%) of maternal deaths. These hospitals are the primary referral

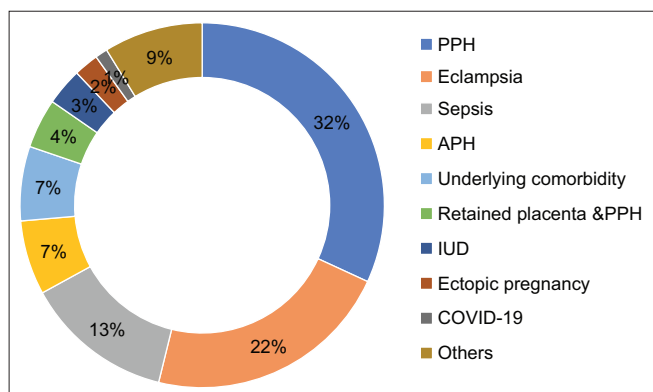


Figure 3: Pie chart depicting the cause of maternal deaths

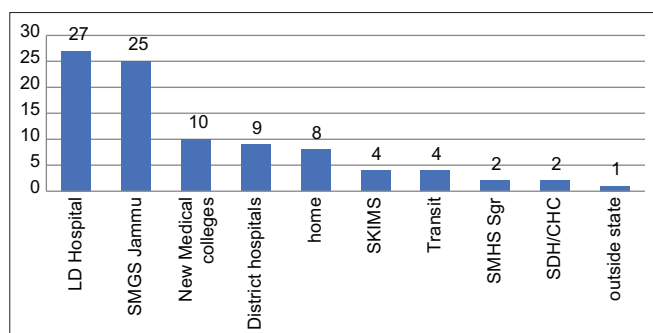


Figure 4: Figure depicting the place of death

hospitals for maternity services in the region and most of the critically ill patients are referred to these two hospitals (Figure 4).

DISCUSSION

The present study estimated the maternal mortality rate of Jammu and Kashmir territory in India for a 1-year period between April 2020 and March 2021. Data were collected from the frontline workers of the region who were first oriented online regarding the process of reporting and the deaths which they have to report. In our view, it is one the first study that had tried to estimate the MMR for J&K. The study adds value as the national vital statistics surveys do not provide MMR estimates for this region.

We estimated the MMR to be 46 per lakh live births. A total of 1.98 lakh live birth had been reported for the same time period with a total of 91 maternal deaths. The MMR reported in our study is significantly lower than the national level MMR of 113. The lower MMR can be explained by higher coverage of key reproductive and child health interventions in the state as compared to that at national level. The same can contribute to lower child mortality rates in the area. As per the latest vital statistics, IMR of J&K is 20 in comparison to 30 at national level.

As child mortality rates have been calculated by same methodology at both state and national level, we expect that the lower IMR in the state reflects better coverage of key RMNCH+A interventions in the state. The mean age at death was 28.6 ± 5.57 years. The causes leading to maternal deaths mean that women die in their productive years. The maternal age at deaths is similar to multiple previous studies.^{16,17}

Eclampsia and PPH were the most common causes of death and contributed to 49 (53.84%) maternal deaths. The other major causes were maternal sepsis (13%), APH (7%), pulmonary thromboembolism, and IUD. The causes are consistent with available literature for India and well as globally.¹⁸⁻²⁰ Anemia is an important risk factor for PPH and its associated mortality, with multiple studies suggesting very high prevalence of anemia in the study area.^{17,21} Improving coverage and quality of antenatal care and care around birth have been categorized as high impact interventions for reducing maternal mortality.^{22,23} Although there has been a significant improvement in ensuring that women undergo ante-natal checkups, multiple studies have pointed to poor quality of services.^{24,25}

Maternal deaths usually happen at tertiary level facilities which are involved in provision of maternal health services. Our study also found that most of the deaths happen at two regional level facilities, with these facilities accounting to 52 (57.14%) maternal deaths. These two facilities are hospitals associated with the two oldest medical colleges in the region and have been providing tertiary care services to the populace of the two regions. District hospitals and new medical colleges (five new medical colleges were operationalized in the past few years) reported 10 (10.98%) maternal deaths. Home deaths contributed to 8.79% of deaths. Although most of the deaths happened at tertiary care facilities, multiple previous studies have found delays at all level particularly during referral from primary care facilities.^{26,27} There is a need to study referral pattern and the associated delays before their arrival at these tertiary care facilities. The delays may mean that, pregnant women are reaching these hospitals in advanced disease which their chances of survival are very bleak.

Timing of deaths is also important as maternal deaths during ante-natal or intra-natal period are invariably also associated with fetal deaths. Furthermore, the timings also determine the priority areas which may need strengthening in the overall health systems. In our study, 66 (72.5%) deaths had occurred in the post-natal period with almost all deaths happening within 48 h of delivery. As PPH and eclampsia form the most common causes of deaths followed by sepsis, we expect most of the deaths to happen during this time period. Primigravidae contributed to 38 (41.8%)

maternal deaths. The results are comparable to previous studies conducted in India and globally.

We analyzed the socio-demographic characteristics of maternal deaths. Most of the women 71 (78%) belonged to Muslim religion with the rest 19 (20.9%) belonging primarily to Hindu religion. The same can be explained by the fact that majority of the residents of the study region follow Islam as their religion. Most of the women who had died were literate with only 15 (16.5%) women being illiterate. The study area has a better female literacy rate than national average as per the latest available census. As our study was based on review of field data, we feel there is a need to review the maternal death surveillance system in districts which have very low MMR (Districts of Srinagar, Kathua, Doda and Budgam). In addition, as the maternal deaths are rare events, we need to interpret district level estimates with caution.

Limitations of the study

Estimation of maternal mortality usually requires a very large sample as maternal death is a rare event. Our study estimates have a large confidence interval and the real estimate may range from 33 to 61. The other limitation could be chance of underreporting of deaths, the degree of which will depend on the sensitivity of the routine maternal death reporting system.

CONCLUSION

We estimated that the maternal mortality of J&K is significantly lower in J&K as compared to India. The primary causes of deaths included PPH, Eclampsia, and sepsis and the health systems locally need to strengthen the overall health-care delivery system to avert these deaths. Although most of the deaths happened at tertiary care centers but there is a need for improving the secondary level health-care facilities to ensure early treatment of complications around birth. There is a need to improve the provision of preventive maternal and child health services (ante natal, intra natal, and post-natal care) for reducing the maternal mortality further.

ACKNOWLEDGMENT

The authors would like to thank the frontline health workers for their support. We would also like to thank NHM J&K for the support.

REFERENCES

1. Stenberg K, Hanssen O, Edejer TT, Bertram M, Brindley C, Meshreky A, et al. Financing transformative health systems

towards achievement of the health Sustainable Development Goals: A model for projected resource needs in 67 low-income and middle-income countries. *Lancet Glob Health*. 2017;5(9):e875-e887.

[https://doi.org/10.1016/S2214-109X\(17\)30263-2](https://doi.org/10.1016/S2214-109X(17)30263-2)

2. Callister LC and Edwards JE. Achieving millennium development goal 5, the improvement of maternal health. *J Obstet Gynecol Neonatal Nurs*. 2010;39(5):590-599.

<https://doi.org/10.1111/j.1552-6909.2010.01161.x>

3. Ronsmans C and Graham WJ. Maternal mortality: Who, when, where, and why. *Lancet*. 2006;368(9542):1189-1200.

[https://doi.org/10.1016/S0140-6736\(06\)69380-X](https://doi.org/10.1016/S0140-6736(06)69380-X)

4. Miller S and Belizán JM. The true cost of maternal death: Individual tragedy impacts family, community and nations. *BMC Reproduct Health*. 2015;12(1):56.

<https://doi.org/10.1186/s12978-015-0046-3>

5. Say L, Chou D, Gemmill A, Tunçalp Ö, Moller AB, Daniels J, et al. Global causes of maternal death: A WHO systematic analysis. *Lancet Glob Health*. 2014;2(6):e323-e333.

[https://doi.org/10.1016/S2214-109X\(14\)70227-X](https://doi.org/10.1016/S2214-109X(14)70227-X)

6. Ni Bhuinneain GM and McCarthy FP. A systematic review of essential obstetric and newborn care capacity building in rural Sub-Saharan Africa. *BJOG*. 2015;122(2):174-182.

<https://doi.org/10.1111/1471-0528.13218>

7. Callister LC and Edwards JE. Sustainable development goals and the ongoing process of reducing maternal mortality. *J Obstet Gynecol Neonatal Nurs*. 2017;46(3):e56-e64.

<https://doi.org/10.1016/j.jogn.2016.10.009>

8. World Health Organization. Maternal mortality. Geneva: World Health Organization; 2021. Available from: <https://www.who.int/news-room/fact-sheets/detail/maternal-mortality> [Last accessed on 2021 Nov 20].

9. Girum T and Wasie A. Correlates of maternal mortality in developing countries: An ecological study in 82 countries. *Matern Health Neonatol Perinatol*. 2017;3:19.

<https://doi.org/10.1186/s40748-017-0059-8>

10. UNICEF. Maternal Mortality Rates and Statistics-UNICEF DATA. New York, United States: UNICEF; 2021. Available from: <https://www.data.unicef.org/topic/maternal-health/maternal-mortality> [Last accessed on 2021 Nov 20].

11. Registrar General of India. Census of India Website: Office of the Registrar General and Census Commissioner, India, SRS; 2021. Available from: https://www.censusindia.gov.in/vital_statistics/srs_bulletins/bulletins.html [Last accessed on 2021 Nov 20].

12. Trends in Maternal Mortality 2000 to 2017: Estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division; 2021. Available from: <https://www.apps.who.int/iris/handle/10665/327595> [Last accessed on 2021 Dec 04].

13. National Family Health Survey (NFHS-5); 2021. Available from: http://www.rchiips.org/nfhs/factsheet_NFHS-5.shtml [Last accessed on 2021 Dec 04].

14. Kumar S, Kumar N and Vivekadhish S. Millennium development goals (MDGs) to sustainable development goals (SDGs): Addressing unfinished agenda and strengthening sustainable development and partnership. *Indian J Community Med*. 2016;41(1):1-4.

<https://doi.org/10.4103/0970-0218.170955>

15. MOHFW. Maternal Death Surveillance and Reporting Guidelines. New Delhi: MOHFW; 2017.

16. Maternal Mortality: Evidence Brief; 2021. Available from: <https://www.apps.who.int/iris/handle/10665/329886> [Last accessed on 2021 Dec 04].

17. Swaminathan S, Hemalatha R, Pandey A, Kassebaum NJ, Laxmaiah A, Longvah T, et al. The burden of child and maternal malnutrition and trends in its indicators in the states of India: The Global Burden of Disease Study 1990-2017. *Lancet Child Adolesc Health*. 2019;3(12):855-870. [https://doi.org/10.1016/S2352-4642\(19\)30273-1](https://doi.org/10.1016/S2352-4642(19)30273-1)
18. Khandale SN and Kedar K. Analysis of maternal mortality: A retrospective study at tertiary care centre. *Int J Reprod Contracept Obstet Gynecol*. 2017;6(4):1610-4. Available from: <https://www.go.gale.com/ps/i.do?p=aone&sw=w&issn=23201770&v=2.1&it=r&id=gale%7ca494584774&sid=googlescholar&linkaccess=fulltext> [Last accessed on 2021 Dec 04].
19. Ahmed I, Ali SM, Amenga-Etego S, Ariff S, Bahl R, Baqui AH, et al. Population-based rates, timing, and causes of maternal deaths, stillbirths, and neonatal deaths in South Asia and sub-Saharan Africa: A multi-country prospective cohort study. *Lancet Glob Health*. 2018;6(12):e1297-e1308. [https://doi.org/10.1016/S2214-109X\(18\)30385-1](https://doi.org/10.1016/S2214-109X(18)30385-1)
20. Tallapureddy S, Velagaleti R, Palutla H and Satti CV. "Near-miss" obstetric events and maternal mortality in a tertiary care hospital. *Indian J Public Health*. 2017;61(4):305-308. https://doi.org/10.4103/ijph.IJPH_268_16
21. Nguyen PH, Scott S, Avula R, Tran LM and Menon P. Trends and drivers of change in the prevalence of anaemia among 1 million women and children in India, 2006 to 2016. *BMJ Glob Health*. 2018;3(5):e001010. <https://doi.org/10.1136/bmjgh-2018-001010>
22. Patel V, Saxena S, Lund C, Thornicroft G, Baingana F, Bolton P, et al. The lancet commission on global mental health and sustainable development. *Lancet*. 2018;392(10157):1553-1598. [https://doi.org/10.1016/S0140-6736\(18\)31612-X](https://doi.org/10.1016/S0140-6736(18)31612-X)
23. Bajpayee D, Sarin E, Chaudhuri S, Dastidar SG, Gupta A, Bisht N, et al. Strengthening the use of partograph in high caseload public health facilities in India through an integrated quality improvement approach. *Indian J Community Med*. 2020;45(4):487-491. https://doi.org/10.4103/ijcm.IJCM_530_19
24. Kumar G, Choudhary TS, Srivastava A, Upadhyay RP, Taneja S, Bahl R, et al. Utilisation, equity and determinants of full antenatal care in India: Analysis from the National Family Health Survey 4. *BMC Pregnancy Childbirth*. 2019;19(1):327. <https://doi.org/10.1186/s12884-019-2473-6>
25. Kuhnt J and Vollmer S. Antenatal care services and its implications for vital and health outcomes of children: Evidence from 193 surveys in 69 low-income and middle-income countries. *BMJ Open*. 2017;7(11):e017122. <https://doi.org/10.1136/bmjopen-2017-017122>
26. Kumari K, Srivastava R, Srivastava M and Purwar N. Maternal mortality in rural Varanasi: Delays, causes, and contributing factors. *Indian J Community Med*. 2019;44(1):26-30. https://doi.org/10.4103/ijcm.IJCM_170_18
27. Ghumare JP and Padvi NV. Assessment of maternal deaths using three delay model at a tertiary care Centre in rural Maharashtra, India: Retrospective six years study. *Int J Reprod Contracept Obstet Gynecol*. 2018;7(8):3043-3048. Available from: <https://www.go.gale.com/ps/i.do?p=hrca&sw=w&issn=23201770&v=2.1&it=r&id=gale%7ca552401450&sid=googlescholar&linkaccess=fulltext> [Last accessed on 2021 Dec 04].

Authors Contribution:

SR - Concept and design of study, development of data collection tools, drafting of manuscript. **AJ** - Concept and design of study and preparation of manuscript. **SMSK** - Concept, data analysis, data interpretation, and preparation of manuscript.

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Source of Support: None, **Conflicts of Interest:** None.