



## Barriers and opportunities in utilizing maternal healthcare services during antenatal period in urban slum settings in India: A systematic review

Rahul Shrivastava<sup>a,b,\*</sup>, Manmohan Singhal<sup>b</sup>, Ashish Joshi<sup>c</sup>, Nivedita Mishra<sup>d</sup>, Amit Agrawal<sup>e</sup>, Bhavna Kumar<sup>b</sup>

<sup>a</sup> Biotechnology Industry Research Assistance Council (BIRAC), National Biopharma Mission, Department of Biotechnology, New Delhi, India

<sup>b</sup> School of Pharmaceutical and Population Health Informatics, Faculty of Pharmacy, DIT University, Dehradun, Uttarakhand, India

<sup>c</sup> The University of Memphis, The University of Texas Health Science Center at Houston, Memphis, TN, USA

<sup>d</sup> ECHO India, New Delhi, India

<sup>e</sup> Department of Paediatrics, Gandhi Medical College, Bhopal, India

### ARTICLE INFO

#### Keywords:

Antenatal care  
Human-centric  
Urban slum  
Framework  
Pregnant women

### ABSTRACT

**Background:** In urban slums, pregnant women are a high-risk group with limited access to health facilities due to reported barriers to utilization of maternal health services linked with sociodemographic variations in a few studies.

**Objective:** Our objective is to assess barriers and opportunities in the current utilization of maternal healthcare services during the antenatal period in urban slum settings followed by the development of a conceptual framework utilizing this information to promote the utilization of maternal services in urban slums.

**Methods:** A search was conducted using PubMed with articles published from January 2011 to May 2022. The search terms used were a combination of 'maternal health services', 'antenatal care', 'urban slums', and 'India'. **Results:** A total of eleven studies met inclusion criteria and was critically appraised by two independent reviewers to retrieve relevant information. Most of them were cross-sectional surveys and only one study was a randomized trial that was conducted in the slums of Delhi and Mumbai. The most common age group included in all studies was 15–49 years. The different barriers found in this review include poor access to healthcare, cost, prior experience, domestic responsibility, long distance to facility, long waiting time at the hospital, non-co-operative hospital staff, multiparity, lack of information, and low literacy.

**Conclusion:** Accessibility to healthcare services in urban slums is poor and slum dwellers are still subjected to the hazards of unsafe home deliveries. It is imperative to address different barriers such as poor accessibility, cost, long waiting time, hospital staff behaviour, and efforts to improve maternal literacy. We also proposed a framework to develop an Artificial Intelligence guided tool that will help identify high-risk pregnancies so that they can be motivated to avail of maternal health services more efficiently.

### 1. Introduction

Maternal health during pregnancy, childbirth, and the postpartum period encompasses the healthcare dimensions of family planning, preconception, and prenatal and postnatal care to reduce maternal morbidity and mortality. Under the National Health Mission (NHM), maternal health has been reported as an important aspect of the development of any country in terms of increasing equity and reducing poverty.<sup>1–4</sup> Despite these, poor families are unable to seek maternal

services due to various cultural-cum-demographic factors. The public health care delivery system plays a vital role in the national program which has been reported to be inefficient, even though the minimum facilities are not often made available to the target groups.<sup>5,6</sup> There have been various factors contributing to maternal mortality processed between the onset of obstetric complications and its outcome including delayed treatment which is often associated with adverse outcomes. A review of delay in the decision to seek care, delay in arrival at a health facility, and delay in the provision of adequate care can give the actual

\* Corresponding author. G-63, Jalvayu Vihar, Sector-25, Noida, Uttar Pradesh, 201301, India.

E-mail addresses: [rahul.shrivastavamph14@gmail.com](mailto:rahul.shrivastavamph14@gmail.com) (R. Shrivastava), [manmohan.singhal@dituniversity.edu.in](mailto:manmohan.singhal@dituniversity.edu.in) (M. Singhal), [ashish.joshi@sph.cuny.edu](mailto:ashish.joshi@sph.cuny.edu) (A. Joshi), [nivedita.048@gmail.com](mailto:nivedita.048@gmail.com) (N. Mishra), [agrawaldramit@yahoo.co.in](mailto:agrawaldramit@yahoo.co.in) (A. Agrawal).

<https://doi.org/10.1016/j.cegh.2023.101233>

Received 3 October 2022; Received in revised form 11 January 2023; Accepted 16 January 2023

Available online 21 January 2023

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picture for address in context to low and middle-income countries (LMIC).<sup>7</sup>

Research indicates that apart from malaria and the HIV epidemic, the main causes of maternal mortality in LMIC are generally similar to those in the United States. However, many of these countries have significantly improved their maternal health outcomes. LMICs such as Timor Leste, Bangladesh, Ethiopia, Uruguay, and India have reported between 78% and 65% reductions in maternal mortality during the same 1990–2013 time period that saw US maternal death rates jump by 136%.<sup>8</sup> Favorably, some studies reveal that maternal mortality and morbidities are preventable, and can be addressed via early detection and care.<sup>9</sup>

The antenatal period is a crucial phase among pregnant women. Antenatal center (ANC) offers a wide range of health promotion and prevention activities. Access to it is dependent on various factors such as place of residence (urban/rural), socio-economic status and other factors. This poses a threat to equity in healthcare services delivered.<sup>10</sup> In India, the national Reproductive and Child Health Programme (RCH) has shown a great effort in enhancing the quality of life of pregnant women in terms by promoting institutional deliveries.<sup>11</sup> However, these services are still underutilized by the residents of the urban slums. In the recent decade, rapid urbanization has led to relatively less focus on urban health in comparison to rural health. Rapid urbanization has also catalyzed an increase in population in the urban slum and shanty towns, with a large fraction of migrants from a rural area. Urban slums are one often overlooked and are the concealed pockets of ill health.<sup>12</sup>

Research shows that AI, automation, and data science can support overburdened health systems and health workers when responsibly deployed. AI-enabled platforms can be used to communicate timely information to the public, support self-care, and communicate initial recommended preventive options and even psychosocial care.<sup>13–17</sup> Hence, we plan to develop an AI-guided citizen-centric predictive model that will help to identify the gaps in utilizing maternal services during ANC and enhance the uptake in utilizing maternal health services during the antenatal period and related pregnancy outcomes.

We, therefore, undertook a systematic review to explore various barriers and opportunities in the utilization of maternal healthcare services amongst pregnant women during the antenatal period in the urban slums of India. We also planned to develop a conceptual framework using a machine learning model to predict at-risk pregnancy outcomes at the earliest. It will help enhance the uptake of maternal healthcare services for the beneficiaries in urban slums.

## 2. Material and methods

The searches were conducted on Medline via the PubMed electronic database to identify the up-to-date literature about the utilization of maternal healthcare services in urban slums in India. The search was performed using a combination of keywords in the search field, including 'maternal healthcare services', 'antenatal care', 'urban slums', and 'India'. The search terms were identified to include maternal healthcare services utilization during the antenatal period amongst pregnant women in urban slum settings. Articles published during the period of January 2011 to May 2022 were included. Subsequently, a secondary literature search was conducted by reviewing the references of the articles that were included in the final analysis through the primary search. Those articles that met the inclusion criteria were included in the final analysis.

Studies published in the English language on maternal healthcare service utilization in urban slums and conducted within India were included in our final analysis. We included studies that focused primarily on delivering maternal healthcare services amongst pregnant eligible women in terms of three antenatal care visits, two tetanus toxoid injections, uptake of iron folic acid tablets, institutional deliveries, and other factors including decision-making for availing the services for

obstetric emergency, accessibility and receiving adequate care amongst pregnant women.

Electronic search entries and secondary sources were excluded if they were not full-text peer-reviewed papers, such as abstract submissions or news report articles. Other studies excluded were systematic reviews, conference papers, and those that focus more on postnatal care, literacy rate, and pregnancy outcome. The literature search was reviewed by the three authors (RS, AJ, and AA).

### 2.1. Variable extraction

The title and abstract screening followed by data extraction from the selected papers was independently conducted by two reviewers (RS and AA). The search results from all databases were imported into Mendeley (1.19.5).<sup>18</sup> No duplicates were found. The titles and abstracts were screened for all the papers. We selected studies mainly on three criteria. The first criteria are the utilization of maternal health, the second criteria are antenatal care centers, and the third criteria are urban slums where pregnant women utilized the ANC services reported for safe deliveries and maternal death.

Data extraction into Microsoft excel was developed based on the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE),<sup>19</sup> Critical Appraisal Skills Programme (CASP),<sup>20</sup> and Consolidated Standards of Reporting Trials (CONSORT)<sup>21</sup> guidelines and include fields on the type and aim of the study, population description, disease condition, inclusion of ANC services, type of outcome and settings. The discrepancies were resolved by discussions between RS and AJ. The narrative data was extracted using summary tables. Mendeley (1.19.5)<sup>18</sup> was used to manage references and MS-Excel (Microsoft Inc, Seattle, WA, USA) was used for data management.

**Study settings:** Studies conducted in urban slums were included in this review. Urban slums are the residential areas where dwellings are unfit for human habitation by reasons of dilapidation, overcrowding, faulty arrangements and design of such buildings, narrowness or faulty arrangement of the street, lack of ventilation, light, or sanitation facilities, or any combination of these factors which are detrimental to the safety and health as defined by Census.<sup>21</sup>

**Targeted audience:** Socio-demographical information was gathered to determine the audience targeted in studies utilizing MCH services including age, literacy, marital status, place of delivery, comorbidities, and mortality.

**Study design:** Randomized control trials (RCT), cohort, descriptive or cross-sectional studies were included while reviews, opinion, editorial, or case studies have been excluded from the review.

**Disease topics:** Information was recorded about the various disease topics that have been addressed through the medium of reviewing these articles in terms of their dietary intake, nutritional deficiency, and anthropometry.

**Conceptual framework description:** The information was recorded to examine whether there were references to any specific theoretical frameworks that have been utilized either in the design and development of maternal health informatics or during the delivery of the intervention using the maternal health informatics platform. Addressing these gaps will help to develop and further evaluate the artificial intelligence citizen-centric guided tool for enhancing the uptake of maternal healthcare services in urban slums. This is important for the future design and development of health information technologies in similar settings. The pregnancy predictors that will be evaluated using the model development approach are listed in [Table 1](#).

### 2.2. Statistical analysis

Descriptive analysis was performed to report means for the continuous variables and frequency analysis for the categorical variables. A kappa statistics analysis was performed to determine the level of

agreement among the two raters on the methodological quality of the studies. All analysis was performed using STATA version 17.

### 3. Results

#### a) Summary of search results:

Literature searches retrieved eight articles through primary search. We further retrieved 10 articles from secondary sources. After reviewing 18 full-text articles, another seven articles were excluded for not meeting the selection criteria. Finally, eleven studies met the inclusion criteria and were critically appraised to retrieve the relevant information (Fig. 1).

Total of 11 articles were published from 2011 to 2022 meeting the inclusion criteria; out of them, maximum four articles were published in the year 2013 followed by two articles each in the year 2015 and year 2018 and one article each in the year 2011, 2012, and year 2014.

#### b) General characteristics of included studies:

Most of the included studies were cross-sectional surveys. Only one study was RCT.<sup>22</sup> The majority of the included studies were conducted in the slums of Delhi followed by Mumbai. The most common age group included in all the studies was: 15–49 years. In the studies, antenatal care, peri-natal care, delivery care, or a combination of these categories were investigated. Among the study populations identified as service users were pregnant women, post-natal women and, occasionally, their partners or mothers-in-law. All the studies mainly focused on maternity care workers and service users.

All studies sourced data for the assessment from, using the National Family Health Survey (NFHS),<sup>23,26</sup> antenatal and child healthcare in urban slums (ANCHUL),<sup>29,30</sup> civil surgeon office,<sup>25</sup> family welfare bureau,<sup>32</sup> district level household and facility survey.<sup>27,28</sup> Other studies<sup>24,31,33</sup> have not mentioned any information on the same. Table 2 highlights the general characteristics of included studies.

#### c) Assessment of various barriers:

All the studies examined barriers encountered by patients to obtain obstetric care with outcomes relating to ANC, perinatal care, maternal morbidity, safe delivery, immunization, nutritional assessment, and quality of care experienced. The different barriers include access, cost, fear and embarrassment, prior experience, domestic responsibility, long distance to facility, the family didn't allow, unavailability of transport, better service at home, long waiting time at the hospital, don't feel necessary, non-co-operative hospital staff, husband not at home, place, education level, multiparity, lack of information, priority to work, large family size, low literacy and not getting money under Janani Suraksha Yojana (JSY). Table 3 highlights the barriers and results from all the studies.

### 4. Discussion

In this systematic review, we have described the published literature on the barriers to utilize obstetric care in India. Thus, we have tried to address the existing gap in maternal healthcare utilization services. Several factors contributed consistently to the utilization of ANC in developing countries. Globally, increasing institutional births is a key strategy to reduce maternal and newborn mortality. Many countries, including India, have implemented incentive programs and policies to encourage institutional births. The rapid increase of low-income urban populations presents a unique set of challenges for these programs, including a lesser knowledge of local services and registration procedures, the lack of a family support system, and the transient nature of the residence.

In 2006, the Indian government launched Janani Suraksha Yojana

(JSY) under its National Rural Health Mission (NRHM), which supports pregnant women with financial support, although the program is open to women aged 19 and above to promote later marriage.<sup>34</sup> Although the JSY program was in full swing, there were still some unofficial and unsafe deliveries occurring in these slums. Out of all the eligible women, about 89% of the women eligible for JSY did not receive any cash incentives the reasons varied from person to person, but the most substantial being, “Non-issuing of JSY cards by the auxiliary nurse-midwifery (ANM’s)” (40%), followed by non-cooperative hospital staff (24%).<sup>25</sup> Only 16.2% of these mothers availed of cash incentive through the JSY scheme in another study.<sup>29</sup> In a similar study, the author also stated that unique issues faced by the urban poor were not specifically addressed by the JSY program. In another study, 76% did not avail of the scheme, 3% reported that they were not entitled, and 16% were unaware of the scheme.<sup>30</sup> Thus, knowledge of such schemes plays a very prominent and important role from both the provider side and the consumer side in availing MCH services.

Education plays a major role in terms of information and health-seeking behaviour. Women with higher education are more likely to be aware of the long-term benefits of taking advantage of services as compared to women with lower education or no education. Education of adolescent mothers was reported to be statistically significant for maternal health service utilization in all surveyed regions of India. Similarly, the education of the husband was reported to be significant in all the studies. However, in one study [Singh L et al.], the husband's education was not as strong a factor as mother's education. The education level of both men and women is therefore critical to increase utilization of maternal health services.

Only three studies evaluated the effect of mass media exposure as a predictor variable.<sup>26,27,33</sup> In these studies, exposure to mass media has been assessed by considering how often the respondents read the newspaper; listen to the radio, television, or cinema. In rural and distant areas, it is hard to reach all mothers health workers and therefore only mass media remains a viable option for the dissemination of information among different communities. The future possibility exists to conduct research through electronic data collection, even though social media, to target more adolescents who are not comfortable talking openly about their pregnancy.

More et al. in his study highlighted the importance of community mobilisation in urban slums.<sup>24</sup> However, the author did not mention if there were any barriers for pregnant women in accessing maternal health services. Thus, there is an observational gap in the published literature in addressing the barriers and opportunities in utilizing maternal healthcare services. We noted that only three of the included studies<sup>25,26,31</sup> evaluated whether adolescent mothers received Tetanus toxoid injection, folic acid and iron tablets. For adolescents, this is particularly crucial since their higher risk for poor maternal health outcomes makes it more important.

Most of the studies have also identified cost as a serious barrier to maternal health care service utilization among poor adolescent women. The cost of accessing healthcare (travel costs, service fees, equipment costs) is a key determinant of whether people seek care or not, especially where healthcare facilities are far away (23, 26, 27]. However, in one study, only 6% of subjects mentioned cost as a reason for not availing services. Therefore, direct costs were not listed as a reason for not choosing hospital births by the author.<sup>29</sup> Accessibility is also identified as a major concern in ANC utilization in all the studies. Due to the time and cost involved with travelling to distant healthcare facilities, women may not be motivated to seek care. The distance to healthcare facilities is important even in developed countries, as women in further away locations are less likely to utilize healthcare.

Saxena et al. in his study considered 3 structural determinants: caste, education and wealth index while 3 intermediary determinants were: age, place of residence of mother, and age at marriage of mother.<sup>28</sup> He analysed those individuals who are non-poor, and from a caste other than general ('others'), are disadvantaged in relation to access to

maternal health services. Thus, he highlighted the central importance of social class in determining inequities in health.

As parity increases, timely initiation of ANC becomes less likely; thus, parity influences ANC initiation largely.<sup>35</sup> Having more experience, these women may feel more confident during pregnancy and consider ANC to be less important.<sup>35</sup> This was evidenced by findings in different studies in which respondents with first pregnancy were more likely to seek ANC than those with more children.<sup>26,29–31</sup>

There was no study that examined women's satisfaction with their ANC experience in developing countries, so we do not know whether ANC use is associated with satisfaction. A long-term positive impact on pregnant women can be achieved by investing in education. It is therefore the responsibility of the government to ensure and enact better educational opportunities for all, with a particular focus on girls' education. It is imperative to strengthen and implement strategies to increase coverage, and to maximize the use of maternal health care. Additionally, interventions aimed at improving knowledge should target the uneducated population, rural residents, and adolescent mothers. Thus, there is a need for pregnant women to be educated during ANC visits about different aspects related to pregnancy, delivery, and infant care. A well-organized educational program should be implemented by physicians, health educators, or nurses.

There are certain limitations to our systematic review. Only studies published in English language were included which would have missed data from other studies. Also, the data sources used for this review were limited to Medline via PubMed. Consequently, it is possible that some potentially relevant studies may have been missed. However, methodology was comprehensive enough to reveal major barriers to obstetric care utilization in rural population of India.

In this study, we found that the accessibility to healthcare services in urban slums is poor despite physical accessibility. District health planning must consider the accessibility of maternal healthcare services to slum residents. It is imperative that healthcare services are scaled up so that all women can receive antenatal care. Changes in attitude and behaviour can be brought about by health education. It is also important that literacy drives focus on promoting awareness of health issues, legal marriage age, and future motherhood to adolescent girls. The health workers need to be judicious about addressing the queries and doubts of mothers and pregnant women during antenatal check-ups, immunization clinics, mothers' groups at anganwadi centers, and home visits. Therefore, we would recommend that the efforts be made to establish a standard measure for defining poor households and to utilize this measure in conducting targeted interventions among the poor sections of the society, removing obstacles to their access to health care services.

## 5. Conclusion

The accessibility to healthcare services in urban slums is poor despite physical accessibility. Slum dwellers are still subjected to the hazards of unsafe home deliveries. The important barriers include lack of access to the healthcare, cost, domestic responsibility, long distance to facility, long waiting time at hospital, non-co-operative hospital staff, lack of information, large family size, and low literacy level. It is imperative that healthcare services are scaled up so that all women can receive antenatal care. Changes in attitude and behaviour can be brought about by improving maternal literacy and by providing health education to pregnant mothers. Health workers need to be judicious about addressing the queries and doubts of mothers and pregnant women. We also proposed a framework to develop an AI-guided tool that will help identify high-risk pregnancies so that they can be motivated to avail of maternal health services more efficiently.

## Ethics approval and consent to participate

Not applicable.

## Consent for publication

Not applicable.

## Source of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Authors' contribution

RS, MS, AJ, and AA: conceptualization; RS, AJ, and AA: data curation; RS and AJ: formal analysis; RS, MS, and AJ: methodology; MS and AJ: supervision; RS and AJ: validation; RS: writing-original draft; RS, MS, AJ, NM and BK: writing-review and editing. All authors critically reviewed and approved the manuscript.

## Declaration of competing interest

None.

## Acknowledgement

We acknowledge all co-authors for their valuable contributions in this manuscript.

## Abbreviations

|         |  |
|---------|--|
| ANC     | Antenatal care   |
| ANCHUL  | Ante Natal and Child Health care in Urban Slums                      |
| ANM     | Auxiliary Nurse Midwifery  |
| CASP    | Critical Appraisal Skills Programme                                  |
| CONSORT | Consolidated Standard of Reporting Trials                            |
| HIV     | Human Immunodeficiency Virus   |
| JSY     | Janani Sishu Yojana  |
| LMIC    | Low- and Middle-Income Countries                                     |
| MCH     | Maternal Child Health  |
| NFHS    | National Family Health Survey  |
| NHM     | National Health Mission  |
| NRHM    | National Rural Health Mission  |
| RCH     | Reproductive Child Health  |
| RCT     | Randomized Controlled Trial  |
| STROBE  | Strengthening the Reporting of Observational Studies in Epidemiology |

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cegh.2023.101233>.

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