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Original Research Article

Tracking of antenatal services and outcomes using community health information system in a slum population of North India

D. S. Faujdar, Neha Dahiya*, Har Ashish Jindal

Department of Community Medicine and School of Public Health, PGIMER, Chandigarh, India

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***Correspondence:**
Dr. Neha Dahiya,
E-mail: drnehadahiya@gmail.com

ABSTRACT

Background: Despite of improvement of public health service, the reach of these services has remained low in urban slums due to various socio cultural and environmental factors.
Methods: An information and communication technology (ICT) based community health information system was installed in a urban primary health centre catering to urban slum populations in North India. The system was used to track all the antenatal cases registered over a period of one and half years for antenatal services, risk factors and antenatal outcome. The system allowed for tracking of antenatal cases for antenatal care (ANC) visits, investigations, high risk factors, delivery and perinatal care. Real-time monitoring of antenatal cases was made possible through dynamic dashboard with indicators.
Results: Among 614 women tracked for ANC and outcome, majority were below 30 years of age (78.3%), belonged to lower caste (85.7%) and many were illiterate (42.8%). Out of all antenatal cases 68% got registered in 1st trimester and only 47% completed 4 ANC visit. Majority delivered in government hospitals (95.4%) with 22.8% delivered through caesarean section. Illiteracy was found to have significant association with higher gravida (>2) ($p<0.001$). The high risk factors were present in 29.5% of antenatal cases and it was found to be significantly associated with increasing age ($p=0.02$) and preterm deliveries ($p<0.001$). Twin pregnancy was also found to be significantly associated with increasing age ($p<0.001$).
Conclusions: An ICT based community health information system can be an effective tool for real-time monitoring of health services, identifying the gaps and tracking of antennal cases especially in difficult to reach slum population.

Keywords: Antenatal, Slum population, High risk, Health information system

INTRODUCTION

Rapid urbanization which is a global phenomenon has also led to increase in the number of urban poor which lives in slums, i.e., urban slums. Population projection stated by United Nations for India has indicated that by 2030 India urban population will grow to 56 million and constitute around 40% of total population.[1] Though access to health services has increased from last few decades but large urban slums have remained unreached by public health services.[2-4] Living in slums predisposes the person to poor environment, poverty, low awareness and insufficient health services, poor referral. These plethora's of factors affect the health indicators of the slum area which contributes to national indicators. In India 20-30% of pregnancies contribute to high risk pregnancies but accounts for 75% of perinatal morbidity and mortality.

With this rationale, the present study was done to assess the utility of technology based health information system to track antenatal services, prevalence of high risk pregnancies, and outcomes in terms of place and type of delivery, low-birth weight and perinatal mortality in the field practice area of urban slums. Additionally gap of

services would help in better policies and programs which could address both service and demand side barrier. Early identification and follow-up of high risk pregnancies through computer based information system may significantly contribute to reduction in maternal and neonatal mortality.

METHODS

The data on antenatal cases was taken from an urban primary health centre (U-PHC) from Northern part of India in Chandigarh. The U-PHC caters to 25000 underprivileged populations, mostly from urban slums. The U-PHC was computerized in September 2017 and a Community Health Information System (CHIS) was developed using free and open source software District Health Information System 2 tracker. The system was aimed to enhance the health care service efficiency through improved follow-up care, better monitoring and generation of quality information. The CHIS allowed enrollment and tracking of women starting from eligible couple, pregnancy, antenatal care, delivery to postnatal care under reproductive and child health programme. In the CHIS demographic information of all the antenatal cases in the community were recorded and they were tracked for provisioning of health care services such as antenatal care (ANC) visits, investigations, identifying high risk, providing financial incentives under national health schemes such as Janani Suraksha Yogna and Maternity Benefit Programme. In the CHIS a dashboard was created to monitor dynamic indicator such as percentage of antenatal cases registered before 12 weeks, percentage of antenatal cases completed four antenatal visits, percentage of antenatal case with high risk pregnancy etc. During the period from September 2017 after installation of the CHIS till February 2019 a total of 880 antenatal cases were enrolled in the CHIS at urban primary health center out of which 12 antenatal cases had an abortion and 614 antenatal cases delivered during the study period. The data available from the CHIS was used for profiling of all 614 antenatal cases who had delivered in the above mentioned period.

For this study, high risk cases were taken as mothers greater than age 35, having medical condition like diabetes or hypertension, bad obstetric history, short stature, previous caesarean section, twin pregnancies, hypothyroid, recurrent abortions, APH or placenta previa, breech, severe anemia and Rh negative.

Ethical approval was obtained from the Institutional Ethics Committee of Post Graduate Institute of Medical Education and Research, Chandigarh, India (INT/IEC/2017/1320).

Statistical analysis

Quantitative data were analyzed by STATA version 14. The key outcome variables were expressed in percentages. Bi-variate analysis was carried out to explore association of factors related to antenatal cases in slum population. Variables with a p-value <0.05 were considered significant.

RESULTS

The community health information system was used for registering antenatal cases, generating work plans for ANMs, scheduling visits and monitoring of high risk cases. On an average 48 antenatal cases were registered every month and approximately 178 antenatal cases were followed-up every month using the CHIS. Out of total of 614 antenatal cases who delivered in last one and half year majority of women (45.1%) belonged to age group of 20-25 years, followed by 33.2% in age group 25-30 years, 12.2% less than 20 years and 9.4% greater than 30 years.

Table 1: Socio-demographic characteristic and antenatal profile of women registered with U-PHC (n=614).

Demographic profile	N (%)
Age in years	
<20	75 (12.2)
20-25	277 (45.1)
25-30	204 (33.2)
>30	58 (9.4)
Caste	
Gen	88 (14.3)
OBC	27 (4.4)
SC	475 (77.3)
ST	12(2)
NK	12(2)
Education	
Illiterate	263 (42.8)
Literate	351 (57.2)
Gravida	
≤2	445 (72.5)
>2	169 (27.5)
Registered in 1st trimester	418 (68)
ANC 1 visit	614 (100)
ANC 2 visits	541 (88.1)
ANC 3 visits	460 (75)
ANC 4 visits	288 (47)
High risk pregnancy	181 (29.5)
Single risk factor	161 (26.2)
More than one risk factor	20 (3.3)

According to caste division 77.3% were scheduled caste, 14.3% general, 4.4% other backward class, 2% scheduled tribe and 2% were not known. Literacy rate among women was 57.2% and 42.8% were illiterate. Majority of women 72.5% were less than or equal to gravida two and 27.5% were more than gravida two. Out of all the women who delivered in the study period, 68% had got registered

before 12 weeks, and at least 2 ANC visits were completed in 88.7%, 3 ANC visits completed in 75%, while 4 ANC visits were completed in only 47% antenatal cases (Table 1).

Place of delivery in 2.6% antenatal cases was at home, 1.9% antenatal cases delivered at private clinic/hospital while remaining 95.4% antenatal cases delivered in government hospitals. As per the type of delivery, 77.2% deliveries were normal vaginal while remaining 22.8% antenatal cases were delivered by caesarean section. The total live births were 98.4% (604) while remaining 1.6% (10) were intrauterine devices (IUDs). Among the total births 32.4% were preterm and 8.3% were early preterm (<34 weeks). Out of total live births 18.9% had low birth weight (<2.5 kg) and 51% birth were female and 49% were males (Table 2).

In present study, 29.5% were high risk pregnancies with 26.2% having single high risk factor and 3.3% having two high risk factors for pregnancy. The top five factors for high risk pregnancy among antenatal cases were found to be thyroid disease (10.1%), previous lower segment caesarean section (LSCS) (6.7%), severe anemia (2.4%), twins (2.3%) and placenta previa (1.6%) (Table 3).

Table 2: Antenatal outcomes in women registered with U-PHC (n=614).

Antenatal outcomes	N (%)
Place of delivery	
Home	16 (2.6)
Private	12 (1.9)
Government hospital	586 (95.4)
Type of delivery	
Normal vaginal	474 (77.2)
Caesarean section	140 (22.8)
IUD	10 (1.6)
Live birth	604 (98.4)
Preterm	199 (32.4)
Early preterm (<34 weeks)	51 (8.3)
Low birth weight (live birth)	114 (18.9)
Gender	
Male	299 (49.0)
Female	315 (51.0)
Perinatal mortality	4 (0.65)

Table 3: High risk pregnancy profile of women registered with U-PHC (n=614).

High risk factors	N (%)
Hypothyroid	62 (10.1)
Previous LSCS	41 (6.68)
Severe anaemia	15 (2.44)
Twins	14 (2.28)
Placenta previa	10 (1.63)
Rh -ve	9 (1.5)
Breech	7 (1.14)
Recurrent abortion	7 (1.14)
Previous IUD	7 (1.14)
Elderly	6 (0.98)
Hypertension	6 (0.98)
GDM	4 (0.65)
HBS Ag+ve	4 (0.65)
PPH	3 (0.48)
Short stature	2 (0.32)
Gall bladder calculus	1 (0.16)
Tuberculosis	1 (0.16)
Teenage	1 (0.16)
Eclampsia	1 (0.16)

Table 4: Association of gravida with literacy.

Literacy	Total N (%)	Gravida >2	Bivariate odds ratio (95% CI)	P value
	N (%)	N (%)		
Literate	351 (57.2)	211 (60.1)	1	
Illiterate	262 (42.8)	214 (81.4)	2.89 (1.2, 4.2)	<0.001

Table 5: Association of age with high risk pregnancy.

Age (in years)	Total	High risk pregnancy	Bivariate odds ratio (95% CI)	P value
	N (%)	N (%)		
<25	352 (57.3)	91 (25.9)	1	
≥25	262 (42.7)	90 (34.4)	1.5 (1.1, 2.1)	0.02

Table 6: Association of preterm with high risk pregnancy.

Preterm (<37 weeks)	Total	High risk pregnancy	Bivariate odds ratio (95% CI)	P value
	N (%)	N (%)		
No	415 (67.6)	100(24.1)	1	
Yes	199 (32.4)	81 (40.7)	2.1 (1.5, 3.1)	<0.001

Table 7: Association of age with twins.

Age (in years)	Total	Twins	Bivariate odds ratio (95% CI)	P value
	N (%)	N (%)		
<25	352 (57.3)	4 (1.1)	1	
≥25	262 (42.7)	10(3.82)	3.4 (1.1, 11.1)	0.03

On performing bivariate analysis, significant association were found in literacy level and gravida more than two (p=0.002) (Table 4), high risk pregnancy with age (p=0.01) and preterm delivery (p<0.001) (Table 5 and 6). Twin pregnancy had significant association increasing age (p<0.001) and mean birth weight of twins was significantly lower than singleton births (p<0.001) (Table 7).

DISCUSSION

The peculiarities of urban slum population were evident in the current study as majority of antenatal cases were young mothers (91.6%), i.e., belonged to age group of less than 30 years. Studies in urban slums have reported 86% to 94.5% of mothers were less than 30 years.[5,6] This difference in the age group reflects the practice of early marriage and pregnancies in Indian societies. According to caste division 79.3% of women belonged to scheduled caste and scheduled tribe which was higher than observed in studies done in slum areas in India (11% to 55%).[6,7] There is close interlink between caste and economic status, with women from lower caste groups often also being poor. A study has highlighted that the health status and health care-seeking behavior of SC and ST provides an indication of both their social exclusion as well as the linkage between poverty and health for this population.[8] In our study around 42.8% of the mothers were illiterate. The studies on mothers in slum area have found illiteracy to be vary over a wide range from 34% to 81%.[5,7] A study has shown significant association between utilization ANC services and literacy of pregnant women.[9] Level of educations plays a crucial role in maternal and birth outcome. Various studies have proven that high education of mother had reduced odds of preterm birth, low birth weight, and small for gestational age.[10] Studies have highlighted that progress among urban-slum residents is slow in terms of increased use of ANC and institutional delivery as compared to urban non-poor, which was observed in present study in terms of only 68% antenatal cases got registered in 1st trimester and just 47% antenatal cases had completed 4 ANC visits.[11] Study at urban slums has found 1st trimester registration to vary from 21% to 52%.[9,12-14] and ≥4 ANC visits during entire pregnancy to be 15% to 42%.[6,14] Late registration deprives mother of essential health services, and as per World Health Organization at least four antenatal visits are recommended during pregnancy.

However, the present study found very high percentage of institutional deliveries (95.4%) as compared to studies done in slum areas of other parts of the country which ranged from 51% to 88%.[6,9,12-14]

Studies done in urban slums of Delhi found still births to be 2.3% and low birth weight was 19.2% which was slightly higher than the finding of present study with 1.6% still births and 18.9% low weight births.[15] However in contrast perinatal deaths reported in study from Delhi, and Jammu slums was 3.7% and 1.3% respectively whereas only 0.65% perinatal deaths and no maternal death was reported in the present study.

In current study, 30.8% of women were primi gravida which was slightly lower than found in study done in Delhi slums (34.9%).[14] Prevalence of high risk pregnancy was found to be 29.5% in our study which is similar to the results of other study who detected 30.6% as high risk pregnancies.[16] However, a study conducted in rural areas of Rohtak and Puducherry stated high risk pregnancies of only 13.7% and 18.3% respectively.[17,18] In present study the top cause for high risk pregnancy were thyroid diseases (10.1%), previous LSCS (6.7%) severe anemia (2.4%) and twins (2.3%) whereas in study done at rural

area of Puducherry hypothyroid cases was just 1.4% and previous LSCS was 1.6%, severe anemia was 1.7% and twins was 1.4%. Women living in urban slums and migrant women are more prone for pregnancy related complications.[16]

In present study 32.4% were preterm and 8.3% were early preterm (<34 weeks) which was much higher than observed in study done in rural areas of Gujarat (8.9%) and Puducherry (18%).[18,19]

In current study, high risk pregnancy is significantly associated with age (p=0.01) which is in line with the results of other study.[5] Significant association of high risk pregnancy was also observed with preterm birth (p<0.001). Similar observation was made by study from Puducherry which observed that low-birth weight and preterm delivery were significantly associated with high-risk pregnancy.[18] Studies have found that lack of antenatal care, clinical anemia, maternal illnesses such as hypertension, and other antenatal complications such as placenta previa are risk factors for pre-term births. [21,22]

In present study twin pregnancy was found to be significantly associated with age of mother. It corroborates with findings of a study on twins in which increase in maternal age, was found to increase twin pregnancy risk.[23] In present study, literacy level was significantly associated with high parity in women which was similar to the findings in a study on female literacy and birth rates.[24]

The study had a limitation that it was not able to make comparison with data available prior to installation of CHIS as the data in registers was found to be incomplete with missing dates, information and had lot of duplicity making it unreliable for comparison.

CONCLUSION

The urban slum population is considered high risk due to hazardous maternal health practices, low literacy levels and barriers existing for utilization of health services. Utilization of healthcare services is poor in urban slums even if accessibility to health services is present. The inherent disadvantages that exist with the slum population require that provision of health services be improved; gaps in the services identified on regular basis and follow-up care is ensured. The community health information system installed in the primary health centre could provide useful data for profiling of antenatal cases, identifying the high risks, allowed easy monitoring of high risk cases, ensured tracking and longitudinal follow-up. The digitization of data is important for improving the quality of data, monitoring of day to day activities and identifying trends on real-time basis. The CHIS provided easy access to data, made it systematic and also brought transparency, accountability which seems to improve the services provided by urban primary health centre to slum population.

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