ORIGINAL RESEARCH ARTICLE

Pandemic Pathways: Exploring Maternal Healthcare Utilization in Lucknow District

Shadma Anwar[1*], Sanober Anwar[2], Areeba Hasan[3], Ruby Khatoon[4], Jamal Masood[5], Zeashan H Zaidi[6]

[1,2,3]Department of Community Medicine, Integral Institute of Medical Sciences & Research, Lucknow, India
[4,5,6]Department of Community Medicine, Era's Lucknow Medical College & Hospital, Lucknow, India

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ABSTRACT

Background: For all women to have access to respectful and excellent maternity care, it is essential to address the inequities that have an impact on health outcomes. The COVID-19 pandemic showed significant challenges for countries continue providing essential maternal and neonatal health services. This study aims to assess maternal healthcare service utilization during the COVID-19 pandemic in Lucknow district.

Methodology: A community based cross sectional study was conducted by using WHO 30 cluster sampling technique to the participants. Total sample size obtained was 30 clusters in rural and 30 clusters in urban area.

Results: The results showed that 36.7% of urban and 41.0% of rural beneficiaries had poor MCH service utilization (<50%), with a further decline compared to pre-pandemic levels. In urban areas, 37.6% and 38.1% in rural areas used 50%-75% of services. Social class was significantly linked to MCH utilization ($p<0.001$), emphasizing the need to address disparities and improve access.

Conclusions: The COVID-19 pandemic disrupted multiple aspects of maternal healthcare, exacerbated by health facility conversions, resource reallocations, and mobility restrictions. Addressing these systemic challenges is critical for ensuring resilient maternal healthcare services in future crises.

Key-words: Maternal Health, Healthcare utilization, Pandemic, COVID-19, Antenatal care Services, Delivery Services

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***Correspondence:** Dr. Shadma Anwar (Email: docshadmaanwar@gmail.com)

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Introduction

Each pregnancy and birth are different. Ensuring equitable maternity care requires addressing health inequities, particularly those linked to sexual and reproductive rights and gender. A major proportion of the child and maternal mortalities occur during child birth and the postnatal period, with most deaths occurring in the first 24 h of birth.[1–3] Despite a tremendous increase in mother and child health over the last few decades, much more needs to be done, particularly in low- and middle-income nations. According to National Family & Health Survey (NFHS-5) 58.1% mothers had at least 4 antenatal care visits in India & 42.4% in Uttar Pradesh. Institutional births in India are at 88.6%, compared to 83.4% in Uttar Pradesh, reflecting a marginal lag in the state.[4]

The Severe Acute Respiratory Syndrome-Corona virus (SARS-cov-2) infection in humans, also known as COVID-19, was declared a Public Health Emergency of International Concern by the World Health Organization (WHO). Since then, the illness has spread over the globe, creating an ongoing pandemic.

The COVID-19 pandemic is currently giving significant challenges for countries to continue to offer crucial, high-quality services for newborns and mothers health. A large number of resources, including midwives, may need to be redirected from conventional service delivery to support pandemic response efforts in countries dealing with the disease. And, pregnant women and mothers with newborns may experience difficulties accessing services due to transport disruptions and lockdown measures or be reluctant to come to health facilities due to fear of infection.[5] The fear of contracting the virus at health facilities, lack of trust in the health system, and misinformation about the source of the disease is creating breeding grounds that may reverse the progress achieved in maternal and child health indicators.[6]

In India, where maternal health outcomes vary widely across states, studies examining the pandemic's impact on maternal healthcare utilization remain limited. Uttar Pradesh, as the most populous state in the country, represents a critical area for such research. This study aims to evaluate the utilization of maternal healthcare services during the COVID-19 pandemic in Uttar Pradesh, addressing a significant gap in an existing article.

The study was conducted to evaluate the utilization patterns of maternal healthcare services during the COVID-19 pandemic in Lucknow district and to identify barriers and facilitating factors influencing access to maternal and child healthcare services during the pandemic.

Methodology

The study is a community based cross-sectional study conducted after obtaining an ethical clearance from the Institutional ethics committee [Ref. No. ELMC&H/RCell/EC/2021/95, dated:17/02/2021].

All pregnant women and mothers who delivered during the period of COVID-19 Pandemic in Lucknow. The study was conducted in the Rural and Urban areas of Lucknow district. WHO 30 cluster sampling technique is used.[7]

Sample size: Sample size was calculated on the basis of WHO 30 Cluster sampling.[7] within each cluster 7 mothers for Maternal Health services who were meeting the eligibility criteria. A total of 30 clusters from urban and 30 clusters from rural areas were picked for the study.

Eligibility Criteria: Women with children 0-1 year and those who delivered during COVID-19 pandemic in Lucknow were included in the study. Subjects who are not resident of Lucknow and subjects who were not ready to participate in the study were excluded from the study.

Data Collection tools: Information was collected on pre-tested, pre-structured questionnaire.

Pre-Testing of Questionnaire: The questionnaire was pretested on a sample of 40 mothers (10% of sample size) for maternal services, 20 each from rural and urban areas. Necessary modifications were made in the schedule to overcome the difficulties encountered during pre-testing.

Data Collection Procedure: A door-to-door survey was conducted, ensuring informed consent and confidentiality. Rapport was established with participants before proceeding with the interview.

Statistical Analysis: Data was analyzed using SPSS-23 software, and chi-square tests were used for categorical comparisons. A p-value of <0.05 was considered statistically significant.

Results

The study aimed to find out the usage of Maternal Healthcare services during COVID-19 pandemic.

The socio-demographic characteristics of the participants revealed that the majority fell within the age group of 25-30 years, with 47.3% in urban areas and 54.0% in rural areas, showing a statistically significant difference (p=0.006). In urban areas, a higher proportion of participants had one child (41.0%), while in rural areas, the majority had two children (41.4%), with a significant association (p=0.019). Additionally, the results indicated that the majority of participants in urban areas belonged to socioeconomic class II (39.0%), while in rural areas, the majority were from socioeconomic class IV (49.3%), demonstrating a highly significant association (p<0.001) as per the modified B.G. Prasad socioeconomic scale (Table 1).

Table 2 revealed that most urban participants were registered with government organizations (55.2%),

as were rural participants (82.9%), showing a highly significant association (p<0.001). In urban areas, most participants reported that health facilities were located within a 30-minute distance (72.2%), while in rural areas, 52.8% of participants had health facilities within the same distance, with a highly significant association (p<0.001). Public transportation was more commonly used in rural areas (45.3%) as well as in urban areas (48.8%) for travel, with a highly significant association (p <0.001).

Table 3 summarizes the distribution of respondents based on the healthcare services received during pregnancy. More than half of the subjects in both urban (63.3%) and rural areas (60.0%) took Iron Folic Acid tablets during their pregnancy.

Table 4 showed that a higher percentage of urban participants had institutional deliveries (95.6%) compared to rural areas (87.0%), with a significant association (p=0.002). More urban participants delivered in private institutions (59.7%), while most rural participants (64.7%) delivered in government facilities (p<0.001). In urban areas, 94.6% of deliveries were by doctors, compared to 84.2% in rural areas, where 7.4% were assisted by trained dais, and 4.7% were delivered by family members at home (p=0.007). Urban areas had more caesarean sections (58.0%), while rural areas had more normal deliveries (71.6%), with a significant association (p<0.001).

Table 5 shows that most participants in both urban (51.0%) and rural (65.7%) areas did not have any postnatal visits to health facilities. Additionally, 25.2% of urban participants and 21.9% of rural participants had only one postnatal visit, with a significant difference (p=0.005).

Table 1: Distribution of Respondents according to Socio-Demographic Characteristics

Variable	Urban (%)	Rural (%)	Total (%)	chi sq.	p-value
Age (in years)					
20 – 25	60 (29.3)	61 (28.4)	121 (28.8)	12.57	0.006
25 - 30	97 (47.3)	116 (54.0)	213 (50.7)		
30 - 35	30 (14.6)	35 (16.3)	65 (15.5)		
35 - 40	18 (8.8)	3 (1.4)	21 (5.0)		
Sex of child					
Male	102 (49.8)	117 (54.4)	219 (52.1)	0.91	0.339
Female	103 (50.2)	98 (45.6)	201 (47.9)		
Type of family					
Nuclear	124 (60.5)	113 (52.6)	237 (56.4)	2.68	0.101
Joint	81 (39.5)	102 (47.4)	183 (43.6)		
Religion					
Hindu	27 (13.2)	109 (50.7)	136 (32.4)	67.5	<0.001
Muslim	178 (86.8)	106 (49.3)	284 (67.6)		
Age at marriage					
<18	2 (1.0)	8 (3.7)	10 (2.4)	4.43	0.109
18-30	202 (98.5)	207 (96.3)	409 (97.4)		
30-40	1 (0.5)	0 (0.0)	1 (0.2)		
No. of living children					
1	84 (41.0)	63 (29.3)	147 (35.0)	7.9	0.019
2	80 (39.0)	89 (41.4)	169 (40.2)		
=/>3	41 (20.0)	63 (29.3)	104 (24.8)		
Social class According to modified BG Prasad classification (2021)					
class1	16 (7.8)	0 (0.0)	16 (3.8)	112.49	<0.001
class2	80 (39.0)	11 (5.1)	91 (21.7)		
class3	56 (27.3)	60 (27.9)	116 (27.6)		
class4	45 (22.0)	106 (49.3)	151 (36.0)		
Education					
Illiterate	23 (11.2)	49 (22.8)	72 (17.1)	73.12	<0.001
just literate	7 (3.4)	24 (11.2)	31 (7.4)		
Primary	6 (2.9)	13 (6.0)	19 (4.5)		
Middle	20 (9.8)	44 (20.5)	64 (15.2)		
high school	42 (20.5)	48 (22.3)	90 (21.4)		
Intermediate	54 (26.3)	30 (14.0)	84 (20.0)		
Graduate	45 (22.0)	7 (3.3)	52 (12.4)		
post graduate	8 (3.9)	0 (0.0)	8 (1.9)		
Occupation					
Unskilled	1 (0.5)	0 (0.0)	1 (0.2)	18.58	0.005
semi-skilled	5 (2.4)	0 (0.0)	5 (1.2)		
Skilled	4 (2.0)	0 (0.0)	4 (1.0)		
clerical/shop owner/farmer	2 (1.0)	0 (0.0)	2 (0.5)		
semi-professional	3 (1.5)	0 (0.0)	3 (0.7)		
Professional	2 (1.0)	0 (0.0)	2 (0.5)		

Table 2: Distribution of Respondents according to Antenatal Care Registration

Variable	Urban (%)	Rural (%)	Total (%)	chi sq	p-value
ANC Registration					
Yes	201 (98.0)	203 (94.4)	404 (96.2)	3.77	0.052
No	4 (2.0)	12 (5.6)	16 (3.8)		
Place					
Gov.	111 (55.2)	170 (82.9)	281 (69.2)	42.93	**<0.001**
Private	90 (44.8)	32 (15.6)	122 (30.0)		
Other	0 (0.0)	3 (1.5)	3 (0.7)		
Facilitator					
ANM	4 (2.0)	1 (0.5)	5 (1.2)	216.85	**<0.001**
AWW	50 (24.9)	24 (11.7)	74 (18.2)		
ASHA	6 (3.0)	149 (72.7)	155 (38.2)		
trained Dai	0 (0.0)	1 (0.5)	1 (0.2)		
Doctor	22 (10.9)	2 (1.0)	24 (5.9)		
Other	119 (59.2)	28 (13.7)	147 (36.2)		
Reason for not registered					
Unfavorable Attitude	3 (75.0)	7 (53.8)	10 (58.8)	1.62	0.805
lack of good services	0 (0.0)	1 (7.7)	1 (5.9)		
lack of knowledge	1 (25.0)	2 (15.4)	3 (17.6)		
lack of transportation due to restriction	0 (0.0)	1 (7.7)	1 (5.9)		
due to closed OPD	0 (0.0)	2 (15.4)	2 (11.8)		
Distance to health facility					
< 30 min.	148 (72.2)	113 (52.8)	261 (62.3)	17.29	**<0.001**
30 min. to 1 hour	57 (27.8)	100 (46.7)	157 (37.5)		
more than 1 hour	0 (0.0)	1 (0.5)	1 (0.2)		
Mode of transport					
Walking	31 (15.1)	85 (39.7)	116 (27.7)	41.66	**<0.001**
public transport	100 (48.8)	97 (45.3)	197 (47.0)		
own vehicle	72 (35.1)	31 (14.5)	103 (24.6)		
Ambulance	2 (1.0)	1 (0.5)	3 (0.7)		
No. of ANC visit					
1	7 (3.4)	14 (6.5)	21 (5.0)	10.16	**0.038**
2	50 (24.4)	73 (34.0)	123 (29.3)		
3	49 (23.9)	41 (19.1)	90 (21.4)		
4 or >4	98 (47.8)	83 (38.6)	181 (43.1)		
None	1 (0.5)	4 (1.9)	5 (1.2)		

Table 3: Distribution of Healthcare Services received during Antenatal Period

Variable	Urban (%)	Rural (%)	Total (%)	Chi sq.	p- value
Nutritional supplements					
Yes	98 (46.7)	88 (41.9)	186 (44.3)	0.97	0.326
No	112 (53.3)	122 (58.1)	234 (55.7)		
Calcium tablets intake					
Yes	125 (59.5)	111 (52.9)	236 (56.2)	1.90	0.169
No	85 (40.5)	99 (47.1)	184 (43.8)		
Iron Folic Acid Tablet Intake					
Yes	133 (63.3)	126 (60.0)	259 (61.7)	0.49	0.482
No	77 (36.7)	84 (40.0)	161 (38.3)		
Duration of IFA intake					
<3 months	13 (9.8)	17 (13.5)	30 (11.6)	19.25	**0.001**
3 months	25 (18.8)	16 (12.7)	41 (15.8)		
<6 months	08 (6.0)	22 (17.5)	30 (11.6)		
6 months	83 (62.4)	57 (45.2)	140 (54.1)		
Left in between the course	04 (3.0)	14 (11.1)	18 (6.9)		
Reason for non- compliance					
Didn't like smell	27 (26.7)	25 (23.8)	52 (25.2)	1.24	0.744
Develop nausea/vomiting	55 (54.5)	56 (53.3)	111 (53.9)		
Allergic reaction	01 (1.0)	03 (2.9)	04 (1.9)		
Other	18 (17.8)	21 (20.0)	39 (18.9)		
Doses of Tetanus Toxoid received					
1 dose	22 (10.7)	23 (10.7)	45 (10.7)	4.25	0.236
2 doses	176 (85.9)	189 (87.9)	365 (86.9)		
>2 dose	4 (2.0)	0 (0.0)	4 (1.0)		
None	3 (1.5)	3 (1.4)	6 (1.4)		
TT injection provided by					
ANM	10 (4.9)	93 (43.9)	103 (24.8)	84.28	<0.001
Doctor	193 (95.1)	119 (56.1)	312 (75.2)		

Table 4: Distribution of Respondents according to Natal Care Services

Variable	Urban (%)	Rural (%)	Total (%)	chi sq.	p-value
Place of delivery					
Home	9 (4.4)	28 (13.0)	37 (8.8)	9.74	**0.002**
Institutional	196 (95.6)	187 (87.0)	383 (91.2)		
Type of Institution (in case of Ins. Del.)					
Govt.	79 (40.3)	121 (64.7)	200 (52.2)	26.14	**<0.001**
Private	117 (59.7)	64 (34.2)	181 (47.3)		
Other	0 (0.0)	2 (1.1)	2 (0.5)		
Reason for home delivery					
Unfavourable Attitude	0 (0.0)	13 (46.4)	13 (35.1)	12.75	0.047
lack of good services	1 (11.1)	0 (0.0)	1 (2.7)		
lack of knowledge	1 (11.1)	1 (3.6)	2 (5.4)		
lack of transportation due to restriction	5 (55.6)	9 (32.1)	14 (37.8)		
unavailability of hospital	1 (11.1)	3 (10.7)	4 (10.8)		
denial by family members	1 (11.1)	0 (0.0)	1 (2.7)		
denial by hospital/doctor	0 (0.0)	2 (7.1)	2 (5.4)		
Reason for institution delivery					
Incentives	1 (0.5)	0 (0.0)	1 (0.3)	37.17	**<0.001**
better services	121 (61.7)	59 (31.6)	180 (47.0)		
Cheaper	1 (0.5)	4 (2.1)	5 (1.3)		
All	73 (37.2)	124 (66.3)	197 (51.4)		
Delivery conducted by					
ANM	2 (1.0)	3 (1.4)	5 (1.2)	14.16	**0.007**
ASHA	0 (0.0)	5 (2.3)	5 (1.2)		
trained dai	7 (3.4)	16 (7.4)	23 (5.5)		

Table 5: Distribution of Respondents according to Post Natal Care Services

Variable	Urban (%)	Rural (%)	Total (%)	chi sq.	p-value
PNC visit to health facility					
1	53 (25.2)	46 (21.9)	99 (23.6)	12.87	**0.005**
2	33 (15.7)	20 (9.5)	53 (12.6)		
More	17 (8.1)	06 (2.9)	23 (5.5)		
None	107 (51.0)	138 (65.7)	245 (58.3)		
Health services received during PNC visit					
Physical examination	49 (47.6)	37 (51.4)	86 (49.1)	4.53	0.104
Counseling on breastfeeding	04 (3.9)	08 (11.1)	12 (6.9)		
Nutritional supplements	00 (0.0)	00 (0.0)	0 (0.0)		
Information about warning signs	00 (0.0)	00 (0.0)	0 (0.0)		
All	50 (48.5)	27 (37.5)	77 (44.0)		
Visit done by health worker within 42 days					
ANM	01 (0.5)	02 (1.0)	03 (0.7)	92.60	**<0.001**
AWW	27 (12.9)	10 (4.8)	37 (8.8)		
ASHA	03 (1.4)	78 (37.1)	81 (19.3)		
Trained Dai	00 (0.0)	01 (0.5)	01 (0.2)		
Other	03 (1.4)	00 (0.0)	03 (0.7)		
None	176 (83.8)	119 (56.7)	295 (70.2)		
No. of home visit					
1	31 (14.8)	63 (30.0)	94 (22.4)	42.35	**<0.001**
2	03 (1.4)	22 (10.5)	25 (6.0)		
More	00 (0.0)	06 (2.9)	06 (1.4)		
None	176 (83.8)	119 (56.7)	295 (70.2)		

Table 6: Distribution of Respondents according to Complications

Variable	Urban (n=200) (%)	Rural (n=200) (%)	Total (n=400) (%)	Chi sq.	p-value
Complication during pregnancy	33 (15.7)	13 (6.2)	46 (11.0)	9.77	**0.002**
Nature of complication					
Night blindness	00 (0.0)	01 (7.7)	01 (2.2)	10.55	0.103
Body swelling	00 (0.0)	02 (15.4)	02 (4.3)		
Weakness	06 (18.2)	00 (0.0)	06 (13.0)		
Vaginal bleeding	04 (12.1)	01 (7.7)	05 (10.9)		
Low BP	01 (3.0)	00 (0.0)	01 (2.2)		
High BP	10 (30.3)	04 (30.8)	14 (30.4)		
Other	12 (36.4)	05 (38.5)	17 (37.0)		
Post natal complication	05 (2.4)	02 (1.0)	07 (1.7)	1.31	0.253

Table 7: Distribution of Respondents according to Overall Maternal Healthcare Service Utilization

Overall MCH Utilization	Urban (%)	Rural (%)	Total (%)	Chi sq.	p-value
(>75%)	54 (25.7)	44 (21.0)	98 (23.3)	1.52	0.467
(50% - 75%)	79 (37.6)	80 (38.1)	159 (37.9)		
(<50%)	77 (36.7)	86 (41.0)	163 (38.8)		
Median (IQR) %	70.21 (6.38 - 76.60)	65.96 (10.64 - 74.47)	68.09 (8.51 - 74.47)		

Table 8: Association Socio-demographic factors with Overall Maternal Healthcare Service Utilization

Variable	MCH Service Utilization		chi sq.	p-value
	Above Median (>=68.09) (%)	Below Median (<68.09) (%)		
Age				
20 - 25 year	61 (50.4)	60 (49.6)	2.87	0.412
26 - 30 year	102 (47.9)	111 (52.1)		
31 - 35 year	35 (53.8)	30 (46.2)		
36 - 40 year	07 (33.3)	14 (66.7)		
Sex of child				
Male	95 (43.4)	124 (56.6)	5.40	**0.020**
Female	110 (54.7)	91 (45.3)		
Type of family				
Nuclear	123 (51.9)	114 (48.1)	2.08	0.149
Joint	82 (44.8)	101 (55.2)		
Place of delivery				
Home	02 (1.2)	164 (98.8)	248.96	**<0.001**
Institutional	203 (79.9)	51 (20.1)		
Setting				
Urban	111 (52.9)	99 (47.1)	2.75	**0.097**
Rural	94 (44.8)	116 (55.2)		
Religion				
Hindu	70 (51.5)	66 (48.5)	0.57	**0.450**
Muslim	135 (47.5)	149 (52.5)		
Age at marriage				
<18	07 (70.0)	03 (30.0)	2.78	**0.249**
18-30	198 (48.4)	211 (51.6)		
30-40	00 (0.0)	01 (100.0)		
No. of living children				
1	81 (55.1)	66 (44.9)	4.24	**0.120**
2	80 (47.3)	89 (52.7)		
=/>3	44 (42.3)	60 (57.7)		
Social class				
class1	16 (100.0)	00 (0.0)	126.45	**<0.001**
class2	76 (83.5)	15 (16.5)		
class3	66 (56.9)	50 (43.1)		
class4	47 (31.1)	104 (68.9)		
class5	00 (0.0)	46 (100.0)		
Education				
Illiterate	32 (39.0)	50 (61.0)	138.64	**<0.001**
Just literate	13 (12.9)	88 (87.1)		
Primary	06 (18.2)	27 (81.8)		
Middle	27 (56.3)	21 (43.8)		
High school	42 (73.7)	15 (26.3)		
Intermediate	42 (80.8)	10 (19.2)		
Graduate	37 (90.2)	04 (9.8)		
Post graduate	06 (100.0)	00 (0.0)		
Occupation				
Housewife	195 (48.4)	208 (51.6)	7.39	**0.287**
Unskilled	01 (100.0)	00 (0.0)		
Semi-skilled	02 (40.0)	03 (60.0)		
Skilled	01 (25.0)	03 (75.0)		
Clerical/shop owner/farmer	01 (50.0)	01 (50.0)		
Semi-professional	03 (100.0)	00 (0.0)		
Professional	02 (100.0)	00 (0.0)		

Table 9: Logistic Regression Analysis showing Relationship of Overall Maternal Healthcare Service Utilization with Likely Significant Characteristics

Influencing Variable	RISK of Below Median MCH Utilization Score				
	B	Std. Error	p-value	OR	95% Confidence Interval
Sex of Child					
Male	0.79	0.33	**0.016**	2.20	1.16 - 4.19
Female	Ref.				
Type of Family					
Nuclear	0.41	0.34	0.235	1.50	0.77 - 2.94
Joint	Ref.				
Place of Delivery					
Home	5.09	0.76	**<0.001**	162.31	36.38 - 724.20
Institutional	Ref.				
Setting					
Urban	0.27	0.43	0.529	1.31	0.56 - 3.06
Rural	Ref.				
Number of live children					
NLC – 1	-0.15	0.43	0.725	0.86	0.37 - 1.99
NLC – 2	-0.10	0.40	0.809	0.91	0.41 - 2.00
NLC - >=3	Ref.				
Socio-economic class					
Class1	-37.39	6034.66	0.995	0.00	0.00 - 0.00
Class2	-18.79	0.56	**<0.001**	0.00	0.00 - 0.00
Class3	-18.31	0.42	**<0.001**	0.00	0.00 - 0.00
Class4	-17.77	0.00		0.00	0.00 - 0.00
Class5	Ref.				

Table 6 demonstrates that a higher percentage of urban participants (15.7%) experienced complications during pregnancy compared to rural participants (6.2%). A significant difference in the incidence of pregnancy complications between urban and rural areas was observed (p=0.002).

Table 7 presents the distribution of respondents based on overall MCH service utilization. The results show that 36.7% of urban beneficiaries and 41.0% of rural beneficiaries had poor utilization (<50%) of maternal and child healthcare services. In contrast, 37.6% of urban participants and 38.1% of rural participants utilized 50%-75% of MCH services. Good utilization (>75%) was observed in 25.7% of urban participants and 21.0% of rural participants.

Table 8 shows that the proportion of above-median MCH service utilization was significantly higher among mothers with female children (54.7% vs. 43.4%) and those who had institutional deliveries (79.9% vs. 1.2%). The results also indicate that social class was significantly associated with MCH utilization (p<0.001). The analysis revealed a significant association between maternal education and MCH service utilization (p<0.001). Higher levels of education were linked to greater utilization of MCH services, indicating that maternal education plays a crucial role in improving the utilization of these services.

Table 9 summarizes the relationship between overall maternal healthcare service utilization and significant characteristics based on logistic regression analysis. The results indicate that factors such as the sex of the child, place of delivery, and social class significantly influence MCH service utilization. Women who delivered at home and those from middle-class backgrounds had poorer utilization of maternal healthcare services compared to others.

DISCUSSION

The present study aimed to assess the utilization of maternal health services during the COVID-19 pandemic in Lucknow, focusing on maternal healthcare service utilization among urban and rural populations. A total of 420 participants were selected through the WHO 30-cluster technique, with equal representation from both rural and urban areas. The results highlighted significant differences in maternal health service utilization between these areas, with urban populations showing higher rates of healthcare facility registration and use, though both groups faced challenges due to the pandemic.

ANC Registration and Utilization: The study found that 96.2% of participants were registered for antenatal care (ANC), with urban areas showing higher registration rates (98%) than rural areas (94.4%). This figure is significantly higher than the national average of 62.5%, as reported in the National Family Health Survey (NFHS-5), where 60.2% of rural women and 70.8% of urban women were registered for ANC.[8] These findings suggest a relatively higher

awareness and access to maternal healthcare in Lucknow compared to national trends, particularly in urban areas. This may be due to better healthcare infrastructure and more proactive health worker engagement in these areas.

However, it is important to note that despite the generally high registration rates, the COVID-19 pandemic created barriers to accessing healthcare services, especially for women in rural areas. Several studies have shown a significant decline in ANC registration and utilization due to factors such as fear of COVID-19 infection, restricted movement, and the reallocation of resources to COVID-19 care. Similar findings have been reported by Das Neves Martins Pires et al. (2021)[9], Ahmed T et al[10] (2021), Hategeka C et al[11] (2021) and Gebreegziabher SB et al[12] (2022), who highlighted the negative impact of the pandemic on maternal healthcare utilization globally. Yet, contrary to these reports, our study found that a significant number of women continued seeking care, especially in government facilities, where the majority of rural women received services, facilitated by community health workers such as ASHA and AWW. This suggests that community-level interventions played a crucial role in ensuring the continuity of maternal health services during the pandemic.

In contrast, the situation in urban areas was different. A larger proportion of urban participants reported being facilitated by family members or relatives who referred them to private clinics. This shift towards private healthcare facilities in urban areas could be attributed to the temporary transformation of public health centers into COVID-19 care centers, which made it difficult for expectant mothers to access routine services. The reliance on private healthcare facilities also points to a significant urban-rural divide in healthcare accessibility, with urban populations increasingly opting for private care, even at the risk of higher costs.

Impact of Health Facility Proximity: The study also examined the accessibility of health facilities. It was found that 72.2% of health facilities in urban areas were within a 30-minute distance, while in rural areas, only 52.8% of health facilities were within the same time frame. This geographic disparity in health facility accessibility may partly explain the differences in healthcare utilization observed in the study. Similar research conducted by Temesgen K. et al[13] (2021) in Ethiopia reported that women who had to travel longer distances were less likely to utilize maternal healthcare services. The longer travel times to health facilities, particularly in rural areas, present a significant barrier to maternal healthcare access. This is further compounded by the logistical challenges posed by lockdown restrictions, which severely limited mobility, especially in rural areas.

The presence of health facilities within closer proximity in urban areas likely contributed to higher rates of ANC visits and institutional deliveries, as women in urban areas were better able to navigate the challenges posed by the pandemic. These findings underscore the importance of improving the accessibility of healthcare facilities, particularly in rural areas, to ensure equitable healthcare access for all.

ANC Visits During the Pandemic: The study observed a significant decline in the number of ANC visits during the pandemic. In urban areas, 36.2% of participants did not take any ANC visits due to lockdown restrictions, closed outpatient departments, and the fear of contracting COVID-19. Only 31.4% of urban women had four or more ANC visits, compared to 39.5% in rural areas. This decline in ANC visits was more pronounced in urban areas, where the lockdown measures and fear of infection deterred many women from seeking routine maternal care. The national data from NFHS-5 reported that 52.3% of urban women and 39.6% of rural women had at least four ANC visits during their pregnancy, indicating that the pandemic had a significant impact on ANC utilization, especially in urban areas.

Several studies have documented a global decline in ANC utilization during the COVID-19 pandemic. For instance, Budhathoki S. et al[14] (2020) and Ahmed T et al[10] (2021) reported similar trends in other countries, with women avoiding healthcare facilities due to fear of infection and logistical barriers. This is consistent with the findings of this study, where the pandemic created a climate of uncertainty and fear, leading to fewer visits to healthcare facilities for routine services.

Institutional Deliveries: Despite the challenges faced during the pandemic, the study found that the majority of women in both urban (95.6%) and rural (87.0%) areas delivered in health facilities, indicating a high preference for institutional deliveries. This is consistent with national data from NFHS-5, which reported institutional delivery rates of 85.5% in urban areas and 82.9% in rural areas in Uttar Pradesh.[8] Institutional deliveries have been promoted globally as a means of ensuring safer deliveries, and the study found that a majority of women in both settings prioritized delivering in healthcare facilities due to concerns about maternal and neonatal health during the pandemic.

However, the study also found that the preference for private healthcare facilities was higher in urban areas (59.7%) compared to rural areas (34.2%), which could be attributed to the shift of government facilities to COVID-19 care centres, as discussed earlier. The reliance on private healthcare in urban areas also suggests that women in these areas may have faced challenges accessing government services during the pandemic.

Delivery Methods and Maternal Health Complications: The study found a significant difference in the mode of delivery between urban and rural areas. In urban areas, 58.0% of deliveries were by caesarean section (LSCS), while 71.6% of rural women had normal vaginal deliveries. This finding is in line with

national and international studies, which have reported higher rates of caesarean deliveries in urban settings.[15,16] The higher LSCS rates in urban areas may be due to factors such as the availability of private healthcare services, where elective caesarean sections are more common, as well as socio-economic factors that influence healthcare decisions. The rise in caesarean deliveries during the pandemic was also noted in other studies, such as those by Ashish KC et al[15] (2020) and Jafree SR et al[17] (2021), which reported an increase in the rate of caesarean sections during the pandemic.

Furthermore, the study found that 15.7% of urban participants and 6.2% of rural participants experienced complications during pregnancy, with urban women more likely to encounter such complications. This could be attributed to higher rates of comorbidities, delayed healthcare seeking, and other socio-economic factors prevalent in urban populations. The increased complications during pregnancy highlight the need for timely and continuous care, particularly in the context of the pandemic, where access to healthcare services was limited.

Postnatal Care Utilization: Another key finding of this study was the low utilization of postnatal care (PNC) services. Only 51.0% of women in urban areas and 65.7% of women in rural areas attended postnatal care services. This finding is concerning, as postnatal care plays a critical role in monitoring maternal and infant health following childbirth. The decline in PNC utilization during the pandemic may be attributed to barriers such as lockdown restrictions, lack of transportation, and the shift to online consultations, which reduced the ability of new mothers to access face-to-face postnatal care. Similar findings have been reported by Karavadra B. et al[18] (2020) and Stirling Cameron E[19] (2021), who highlighted the difficulties faced by mothers in accessing postnatal care during the pandemic.

Socio-Demographic Factors: The study found that socio-demographic factors such as social class, education, and income were significantly associated with the utilization of maternal healthcare services. Higher MCH utilization was observed among women with higher education and income levels. This finding is consistent with other studies, such as those by Temesgen K et al[13] (2021) and Tadesse E[20] (2020), which reported that women with higher education and income were more likely to utilize maternal healthcare services. The results of this study emphasize the need to address socio-economic disparities in healthcare access to ensure equitable maternal health outcomes for all women, particularly in low-income and rural settings.

Conclusion

In conclusion, this study highlights the challenges and disparities in maternal healthcare utilization during the COVID-19 pandemic in Lucknow. While the overall registration for ANC and institutional deliveries remained high, there was a significant decline in ANC visits, postnatal care utilization, and an increase in complications, particularly in urban areas. The findings underscore the importance of addressing both geographical and socio-economic barriers to ensure equitable access to maternal healthcare services, especially during times of crisis like the COVID-19 pandemic. Targeted interventions, including improving healthcare infrastructure, increasing awareness, and addressing socio-economic inequalities, are crucial to improving maternal health outcomes in both urban and rural areas.

Author contribution: SA: played a key role in every stage, from conception to manuscript preparation; **SA:** Data collection, Analysis and Manuscript preparation; **AH, RK and JM:** Study conception, Study design and Manuscript preparation; **ZHZ:** Study design and Analysis

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