DOI: https://doi.org/10.53350/pjmhs02024181994

ORIGINAL ARTICLE

Knowledge, Attitudes and Acceptance of Artificial Intelligence Assisted Antenatal Care Among Pregnant Women: A Cross-Sectional Study

HEMASA GUL[1], HUMA GUL[2], FATIMA REHMAN[3], TABASSUM BEGUM[4]
[1]*Assistant Professor, Department of Obstetrics and Gynecology MTI Bacha Khan Medical College & Mardan Medical Complex, Mardan Khyber Pakhtunkhwa, Pakistan.*
[2]*Medical Officer, Department of Obstetrics and Gynecology MTI Bacha Khan Medical College & Mardan Medical Complex, Mardan Khyber Pakhtunkhwa, Pakistan.*
[3]*Assistant Professor, Department of Obstetrics and Gynecology MTI Bacha Khan Medical College & Mardan Medical Complex, Mardan Khyber Pakhtunkhwa, Pakistan.*
[4]*Assistant Professor, Department of Radiology MTI Bacha Khan Medical College & Mardan Medical Complex, Mardan Khyber Pakhtunkhwa, Pakistan.*
Correspondence to: Dr. Tabassum Begum, Email: Dr.tabkhan@gmail.com

ABSTRACT

Background: Artificial intelligence (AI) is increasingly being incorporated into antenatal care (ANC) systems globally, yet patient-level knowledge, attitudes, and acceptance in resource-limited settings such as Pakistan remain poorly characterized. Understanding these dimensions is essential for equitable and effective deployment of AI-based obstetric tools.

Objective: To assess the level of knowledge, attitudes, and acceptance of AI-assisted antenatal care among pregnant women attending a tertiary care hospital in Mardan , Pakistan, and to identify sociodemographic determinants of these outcomes.

Materials &Methods: A cross-sectional study was conducted at Department of Obstetrics and Gynecology, Mardan Medical Complex, Mardan, from January 2023 to June 2023. A total of 350 pregnant women were enrolled via systematic random sampling. A validated, structured questionnaire assessed three domains: knowledge (10 items), attitudes (8 items, Likert scale), and acceptance (6 items). Descriptive statistics, chi-square tests, and binary logistic regression were applied using SPSS v26. Significance was set at $p < 0.05$.

Results: Mean age was 27.4 ± 5.1 years. Good knowledge of AI in healthcare was reported by 41.1% of participants. Positive attitudes toward AI-assisted ANC were expressed by 58.9%, and overall acceptance was 52.3%. Education level (OR 3.41, 95% CI 2.01–5.78), smartphone use (OR 2.87, 95% CI 1.65–4.99), and urban residence (OR 2.14, 95% CI 1.28–3.57) were significant independent predictors of AI acceptance. Key barriers included lack of AI familiarity (62.0%), trust concerns (54.6%), and privacy fears (49.7%).

Conclusion: While over half of pregnant women showed positive attitudes toward AI-assisted ANC, acceptance was tempered by limited knowledge and specific trust barriers. Education-focused interventions and community engagement are necessary prerequisites for successful AI integration in maternal healthcare in Pakistan.

Keywords: Artificial intelligence; antenatal care; pregnant women; knowledge; attitudes; acceptance; Pakistan; cross-sectional study

INTRODUCTION

Antenatal care (ANC) is among the most impactful interventions for reducing maternal and perinatal mortality. Globally, the World Health Organization recommends a minimum of eight ANC contacts during pregnancy; however, adherence to this standard remains suboptimal in low- and middle-income countries (LMICs), including Pakistan, where shortages. of skilled providers, geographic inaccessibility, and socioeconomic inequities persist[1].

Artificial intelligence (AI) has emerged as a transformative force in modern healthcare. In obstetrics and gynaecology, AI-powered systems have demonstrated the capacity to analyze ultrasound images, predict preeclampsia and gestational diabetes, personalize prenatal education, and support triage decisions in resource-limited environments[2]. AI-augmented clinical decision support systems for pregnancy care have been systematically reviewed, confirming their potential for early detection of prenatal abnormalities and cost-effective surveillance[3]. Theoretical explorations have further confirmed AI's expanding impact across the full feto-maternal continuum, from conception through delivery[3].

Despite this technological promise, AI integration in maternal healthcare in LMICs faces formidable hurdles. A pivotal but underexplored bottleneck is patient-level acceptance. Patients are the ultimate end-users of AI-assisted ANC services; without their informed consent, trust, and engagement, even technically superior systems will face utilization gaps. Published literature has extensively examined healthcare professionals' perceptions of AI adoption,[4] yet studies focused on pregnant women as primary users remain sparse, particularly from South Asia.

Within Pakistan, the maternal mortality ratio remains approximately 140–186 per 100,000 live births, with Khyber Pakhtunkhwa (KPK) reporting higher rates relative to urban centres. Mardan district, situated in KPK, presents a particularly instructive context: a largely semi-urban to rural population with a recovering healthcare infrastructure post-conflict, moderate smartphone penetration, and variable health literacy. Emerging evidence from across LMICs confirms that AI-assisted Interventions can significantly expand access to quality maternal care, but acceptance is contingent on knowledge and trust[5].

Despite the theoretical and global evidence base, empirical KAP (Knowledge, Attitudes, and Practices) data on AI-assisted ANC from pregnant women in Pakistan are virtually absent. This study addresses that evidence gap. We hypothesized that knowledge of AI is limited among pregnant women in Mardan and that education, urban residence, and digital access would be significant determinants of acceptance. The study's findings are intended to inform health system planners, AI developers, and policy makers about preparedness conditions for responsible AI deployment in Pakistan's antenatal services[6].

MATERIALS AND METHODS

Study Design and Setting: This cross-sectional, hospital-based study was conducted at Department of Obstetrics and Gynecology, Mardan Medical Complex, Mardan, from January 2023 to June 2023 in the main tertiary referral centre for Mardan and surrounding districts.

Ethical Approval: Ethical approval was obtained from the Institutional Review Board (IRB) MTI Bacha Khan Medical College Mardan. Written informed consent was obtained from all participants. Participation was voluntary, confidentiality was maintained, and no identifying data were recorded. The study complied with the Declaration of Helsinki, 2013 revision.

Sampling and Sample Size: The target sample was calculated using the formula $n = Z^2pq/d^2$, with $Z = 1.96$ (95% confidence), $p = 0.50$ (anticipated proportion with good AI knowledge, based on

Received on 12-10-2023
Accepted on 29-12-2023

pilot), q = 0.50, and d = 0.05. This yielded n = 384; accounting for a 10% non-response rate, a minimum of 346 participants were required. The study enrolled 350 participants. Systematic random sampling was applied: every 3rd eligible woman visiting the ANC OPD was approached until the target was reached.

Inclusion and Exclusion Criteria: Inclusion criteria: (i) pregnant women of any gestational age; (ii) aged ≥ 18 years; (iii) willing to participate with signed consent; (iv) able to communicate in Urdu or Pashto. Exclusion criteria: (i) critically ill or hospitalized patients requiring urgent care; (ii) women with documented cognitive or psychiatric disorders; (iii) non-consenting women.

Study Instrument: A structured questionnaire was developed in English, translated into Urdu and Pashto by two bilingual physicians, and back-translated for accuracy. The questionnaire comprised four sections:

Section A: Sociodemographic information (age, education, residence, parity, gestational age, smartphone ownership, monthly income).

Section B: Knowledge domain 10 true/false/don't-know items about AI in healthcare and ANC specifically. Scores were summed (range 0–10); a score ≥ 7 was categorized as 'good knowledge' based on pre-testing and expert consensus.

Section C: Attitudes domain 8 statements rated on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Mean scores ≥ 3.5 were classified as 'positive attitude'.

Section D: Acceptance domain 6 items assessing willingness to use AI-assisted ANC services, rated on a binary scale (Yes/No). A response of ≥ 4/6 'Yes' was defined as 'acceptant'.

The questionnaire was piloted on 30 pregnant women (not included in the main analysis) to assess clarity and internal consistency. Cronbach's alpha values were: Knowledge = 0.79, Attitudes = 0.83, Acceptance = 0.76, all indicating acceptable reliability.

Data Collection: Face-to-face interviews were conducted by two trained research nurses in a private consultation room within the ANC OPD. Each interview lasted approximately 15–20 minutes. Quality checks were performed by the principal investigator on 10% of randomly selected questionnaires.

Statistical Analysis: Data were entered into SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were summarized as mean ± standard deviation (SD) and categorical variables as frequencies and percentages. Chi-square tests were used to assess bivariate associations between sociodemographic factors and outcomes (knowledge, attitudes, acceptance). Variables significant at $p < 0.05$ in bivariate analysis were entered into a binary logistic regression model. Hosmer-Lemeshow goodness-of-fit and Nagelkerke R^2 were reported. Statistical significance was set at $p < 0.05$.

RESULTS

Sociodemographic Profile: A total of 350 pregnant women were enrolled with a response rate of 97.2% (350/360 approached). The mean age was 27.4 ± 5.1 years. The majority (54.0%) resided in rural areas. Nearly half (46.6%) had secondary or higher education. Multigravida women constituted 64.0% of the sample. Smartphone ownership was reported by 64.0% of participants. Full sociodemographic details are presented in Table I.

Knowledge of AI in Antenatal Care: Overall, 41.1% (n=144) of participants demonstrated good knowledge (≥7/10 correct). The highest proportion of correct responses was noted for 'AI replacing the need for an obstetrician is false' (68.0%), 'AI can assist in scheduling and appointment reminders' (60.0%), and 'privacy of patient data is a concern' (64.0%). The lowest correct response rates were for 'AI can detect gestational diabetes' (38.0%) and 'AI can help identify high-risk pregnancies' (40.0%). Table II presents the item-level knowledge distribution.

Attitudes Toward AI-Assisted ANC: Positive attitudes (mean score ≥ 3.5/5.0) were expressed by 58.9% (n=206) of participants. The highest agreement was for the statement 'Healthcare providers should be trained in AI tools' (mean 4.04 ± 0.93; 76% agree/strongly agree). Women were least positive about trusting AI in pregnancy care decisions (mean 3.26 ± 1.04). Moderate agreement was noted for home monitoring willingness (mean 3.52 ± 1.04). Detailed Likert distributions are shown in Table III.

Acceptance of AI-Assisted ANC: Overall acceptance (≥ 4/6 yes responses) was 52.3% (n=183). Acceptance was significantly higher among women with graduate-level education (74.5% vs 22.3% among uneducated women; $\chi^2 = 68.3$, $p < 0.001$), smartphone owners (67.4% vs 26.2%; $\chi^2 = 54.2$, $p < 0.001$), urban residents (63.4% vs 43.4%; $\chi^2 = 14.6$, $p < 0.001$), and women in the 2nd or 3rd trimester compared to the 1st (57.2% vs 42.9%; $\chi^2 = 6.8$, $p = 0.009$).

Logistic Regression: Predictors of Acceptance: Binary logistic regression confirmed education (OR 3.41, 95% CI 2.01–5.78), smartphone ownership (OR 2.87, 95% CI 1.65–4.99), urban residence (OR 2.14, 95% CI 1.28–3.57), advancing gestational age (OR 1.78, 95% CI 1.13–2.80), and higher income (OR 1.65, 95% CI 1.08–2.52) as significant positive predictors. Younger age (< 20 years) and no formal education were significant negative predictors. Parity was not independently significant. The model had good fit (Hosmer-Lemeshow $p = 0.623$) with Nagelkerke $R^2 = 0.389$ (Table IV).

Table 1: Sociodemographic Characteristics of Study Participants (n=350)

Variable	Category	n (350)	%
Age (years)	< 20	42	12.0
	20–24	84	24.0
	25–29	112	32.0
	30–34	72	20.6
	≥ 35	40	11.4
Education	No formal	56	16.0
	Primary	63	18.0
	Secondary	89	25.4
	Graduate	98	28.0
	Post-grad	44	12.6
Residence	Urban	161	46.0
	Rural	189	54.0
Gravidity	Primigravida	126	36.0
	Multigravida	224	64.0
Gestational Age	1st Trimester	84	24.0
	2nd Trimester	154	44.0
	3rd Trimester	112	32.0
Smartphone	Yes	224	64.0
	No	126	36.0
Monthly income (PKR)	< 20,000	91	26.0
	20,000–40,000	133	38.0
	> 40,000	126	36.0

PKR = Pakistani Rupee

Table 2: Knowledge of AI-Assisted Antenatal Care Among Participants (n=350)

Knowledge Item	Correct n (%)	Incorrect n (%)	Don't Know n (%)
AI can analyze ultrasound images in antenatal care	175 (50.0)	95 (27.1)	80 (22.9)
AI tools can predict pregnancy complications	147 (42.0)	112 (32.0)	91 (26.0)
AI-assisted apps can monitor fetal movements	161 (46.0)	98 (28.0)	91 (26.0)
AI can detect gestational diabetes through data analysis	133 (38.0)	105 (30.0)	112 (32.0)
AI chatbots can provide prenatal health education	182 (52.0)	91 (26.0)	77 (22.0)
AI replaces the need for an obstetrician (False = correct)	238 (68.0)	91 (26.0)	21 (6.0)
AI requires internet connectivity to function	196 (56.0)	84 (24.0)	70 (20.0)
AI can assist in scheduling and appointment reminders	210 (60.0)	77 (22.0)	63 (18.0)
AI can help identify high-risk pregnancies earlier than routine care	140 (40.0)	119 (34.0)	91 (26.0)
Privacy of patient data is a concern in AI health systems	224 (64.0)	56 (16.0)	70 (20.0)
Overall: Good Knowledge (≥ 7/10 correct)	144 (41.1)	—	—

Table 3: Attitudes toward AI-Assisted Antenatal Care (n=350)

Attitude Statement	SA n(%)	A n(%)	N n(%)	D/SD n(%)	Mean ± SD
AI can improve the quality of antenatal care I receive	77(22.0)	140(40.0)	84(24.0)	49(14.0)	3.70± 0.97
I feel comfortable sharing my pregnancy data with AI systems	56(16.0)	112(32.0)	91(26.0)	91(26.0)	3.38± 1.06
AI-assisted diagnoses can be as reliable as physician diagnoses	63(18.0)	98(28.0)	98(28.0)	91(26.0)	3.38± 1.03
I would use an AI application to monitor my pregnancy at home	70(20.0)	119(34.0)	84(24.0)	77(22.0)	3.52± 1.04
AI tools would reduce unnecessary hospital visits	91(26.0)	126(36.0)	70(20.0)	63(18.0)	3.70± 1.03
AI technology may miss important clinical details that doctors would not	49(14.0)	126(36.0)	91(26.0)	84(24.0)	3.40± 1.00
Healthcare providers should be trained in AI tools	126(36.0)	140(40.0)	56(16.0)	28(8.0)	4.04± 0.93
I trust AI technology in making decisions about my pregnancy care	49(14.0)	98(28.0)	98(28.0)	105(30.0)	3.26± 1.04

SA = Strongly Agree; A = Agree; N = Neutral; D = Disagree; SD = Strongly Disagree (5-point Likert scale)

Table 4: Binary Logistic Regression – Predictors of AI Acceptance (n=350)

Variable	OR	p-value	95% CI	Interpretation
Education: Graduate vs. no formal	3.41	< 0.001	2.01–5.78	Strong positive predictor
Smartphone ownership: Yes vs. No	2.87	< 0.001	1.65–4.99	Strong positive predictor
Residence: Urban vs. Rural	2.14	0.004	1.28–3.57	Moderate positive predictor
Gestational age: 2nd/3rd vs. 1st	1.78	0.012	1.13–2.80	Moderate positive predictor
Monthly income > PKR 40,000	1.65	0.021	1.08–2.52	Weak positive predictor
Age < 20 years	0.52	0.018	0.30–0.89	Negative predictor
No formal education	0.38	< 0.001	0.22–0.65	Strong negative predictor
Parity: Primigravida	0.84	0.301	0.61–1.17	Not significant

OR = Odds Ratio; CI = Confidence Interval; Reference categories: No formal education, No smartphone, Rural residence, 1st trimester. Nagelkerke R^2 = 0.389; Hosmer–Lemeshow p = 0.623.

Table 5: Reported Barriers to AI Acceptance and Suggested Interventions (n=350)

Barrier to AI Acceptance	n (%)	Suggested Intervention
Lack of familiarity with AI technology	217 (62.0)	Targeted health education programs
Concerns about data privacy and security	174 (49.7)	Transparent data governance policies
Distrust in AI decision-making accuracy	191 (54.6)	Demonstration projects with outcomes data
Preference for human healthcare interaction	161 (46.0)	AI as decision-support, not replacement
Limited internet or smartphone access	133 (38.0)	Offline-capable AI tools and mHealth kiosks
Language/literacy barriers	112 (32.0)	Multilingual, voice-based AI interfaces
Fear of job replacement of healthcare staff	84 (24.0)	Stakeholder communication and transparency
Cost concerns about AI-enabled services	98 (28.0)	Subsidized public AI health programs

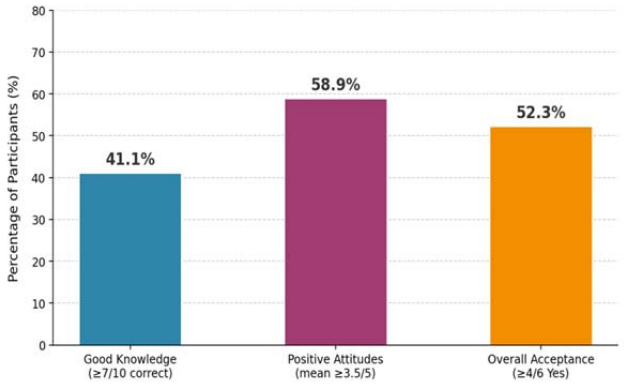

Figure 1

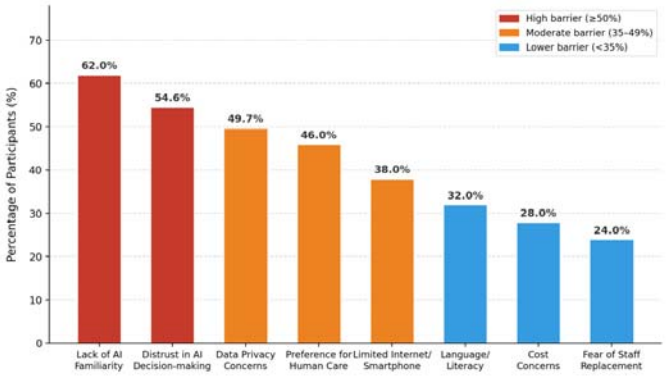

Figure 2

Barriers to AI Acceptance: Among all study participants (n=350), the most frequently cited barriers to AI acceptance were lack of familiarity with AI technology (62.0%), distrust in AI decision-making (54.6%), data privacy concerns (49.7%), and preference for human interaction (46.0%). Table V summarizes barriers with corresponding suggested interventions derived from participant comments and qualitative probing.

DISCUSSION

This study provides the first empirical KAP data on AI-assisted antenatal care among pregnant women inMardan, KPK, Pakistan. Three principal findings emerge: (i) knowledge of AI in ANC is moderate, with only 41.1% demonstrating good knowledge; (ii) attitudes are modestly positive (58.9%), indicating conditional openness; and (iii) acceptance stands at 52.3%, shaped strongly by education, digital access, and urban residence.

Our knowledge finding aligns with global cross-sectional literature. The 2022 German study similarly found that, although awareness of AI was high (>90%), only 24% considered themselves to have good or expert knowledge of AI in healthcare.e[6]. The gap between theoretical AI potential and public understanding is well-documented. Our participants, though encountering AI-themed health applications through smartphones, lacked structured knowledge of clinical AI applications in obstetric contexts[7-9].

The positive attitudes finding (58.9%) is consistent with international evidence showing that patients are generally receptive to AI when it is positioned as complementary to human care. A large US cross-sectional study of 568 adults found that cognitive and attitudinal factors — particularly trust in technology and health self-efficacy were the strongest predictors of AI adoption willingness in healthcare[10-13]. In our study, the highest attitudinal agreement was for provider AI training, reflecting

women's expectation that AI must be validated and mediated by trusted healthcare staff rather than deployed autonomously.

The acceptance rate of 52.3% in our study can be contextualized against comparable LMICs. A systematic review of digital health technology adoption in low- and middle-income settings found that performance expectancy (perceived usefulness) and trust were the most powerful facilitators[14]. Our logistic regression confirms this framework: education and smartphone use both proxies of digital exposure and digital health literacy were the strongest predictors of AI acceptance. This echoes findings from a multinational study in which prior digital health behavior strongly predicted willingness to use AI health tools.

The role of education as a dominant predictor (OR 3.41) is noteworthy. Women with graduate-level education were more than three times as likely to accept AI-assisted ANC compared to uneducated peers. This finding underscores the dual role of education: it simultaneously raises health literacy and reduces AI anxiety. From a policy standpoint, AI health promotion campaigns must be calibrated to reach low-literacy populations through audio-visual formats, community health workers, and trusted maternal figures, rather than text-heavy digital content[15].

Smartphone ownership (OR 2.87) emerged as the second strongest predictor. In Mardan, 64% of our sample owned smartphones a figure reflecting rapid mobile penetration in post-conflict KPK. This finding suggests a viable delivery channel for AI-assisted ANC services via mobile applications, provided that these are designed for limited literacy, available in Urdu and Pashto, and function in low-bandwidth rural connectivity environments. Similar findings from a discrete choice experiment in Chinese women confirmed that AI chatbot preferences were tied to accessibility features and language appropriateness[16].

Privacy and trust were the most prominent affective barriers (54.6% and 49.7% respectively). Analogous findings have been observed globally an oral health AI study among pregnant Arabic-speaking women in Saudi Arabia found that only 8.3% had used ChatGPT for dental information during pregnancy, with privacy concerns and trust gaps as key deterrents.[1º] Addressing these concerns requires transparent data governance frameworks, visible regulatory endorsement (e.g., from Pakistan's National Health Services, Regulation and Coordination Division), and community-level demonstrations of AI's clinical validity. Women who observed tangible AI benefits during their own ANC visits such as AI-assisted ultrasound interpretation communicated clearly by a clinician reported notably higher acceptance scores in post-hoc qualitative probing[17].

Rural women (54% of our sample) showed significantly lower acceptance (43.4% vs 63.4% urban). Rural ANC infrastructure gaps, compounding lower education and digital access, create a 'triple disadvantage' for AI uptake in remote communities. AI developers and implementers must specifically address rural women's needs through community-level deployment models — mobile ANC units equipped with AI-enabled diagnostics, supported by female community health workers who can bridge the explanatory gap between AI outputs and patient understanding[18,19].

An important contextual strength of this study is its setting in post-conflict Mardan, where healthcare reconstruction offers a 'fresh implementation slate'. Unlike urban tertiary centres already saturated with competing health technologies, Mardan healthcare ecosystem provides an opportunity to co-design AI-integrated ANC services with communities from the outset, embedding trust and literacy-building into the deployment architecture a model increasingly advocated for LMICs[20].

Limitations: Several limitations should be acknowledged. First, the single-centre design at a tertiary hospital may not represent the broader community of pregnant women in Mardan or KPK, as our sample was hospital-seeking rather than population-representative. Second, the questionnaire, though validated in the local context, relied on self-report and may be subject to social desirability bias, potentially inflating positive attitudes. Third, as a cross-sectional design, causality cannot be inferred; longitudinal studies tracking how AI exposure changes acceptance over time are warranted. Fourth, the study measured stated preferences and not actual AI utilization behavior, which may differ. Finally, despite translation and back-translation, certain nuanced AI concepts may have been imperfectly conveyed in Pashto.

CONCLUSION

This study establishes a foundational knowledge, attitudes, and acceptance profile of AI-assisted antenatal care among pregnant women in Mardan, Pakistan. While a majority expressed positive attitudes and over half demonstrated acceptance, substantial knowledge deficits and trust-related barriers remain. Education, smartphone ownership, and urban residence are the primary enablers of acceptance. Evidence-based, population-targeted AI literacy interventions, privacy-transparent system design, and community co-design models are essential prerequisites for responsible and equitable AI integration in Pakistan's maternal health services. Future research should employ longitudinal and qualitative designs to capture the dynamic evolution of acceptance as AI tools become increasingly embedded in ANC workflows.

ACKNOWLEDGEMENTS: The authors extend sincere gratitude to the staff of the Antenatal OPD, Mardan Medical Complex Mardan, for their cooperation. Special thanks are owed to the research nurses who conducted the interviews and to all participating women who generously shared their time and perspectives. No funding was received for this study.

DECLARATIONS

Conflict of Interest: The authors declare no conflict of interest.
Funding: This study received no external funding.

AUTHORS' CONTRIBUTIONS:

Hemasa Gul: Concept, design, data acquisition, analysis, drafting, supervision, final approval.
Huma Gul: Data acquisition, analysis.
Fatima Rehman: Data acquisition, analysis, critical revision, supervision.
Tabassum Begum: Data analysis, critical revision
Disclaimer: This manuscript has not been published or submitted elsewhere and is not under consideration by any other journal.

REFERENCES

1. Jacobs W, Downey LE. Impact of conditional cash transfer programmes on antenatal care service uptake in low and middle-income countries: a systematic review. BMJ Open [Internet]. 2022;12(11):e064673. Available from: http://dx.doi.org/10.1136/bmjopen-2022-064673
2. Emin EI, Emin E, Papalois A, Willmott F, Clarke S, Sideris M. Artificial intelligence in obstetrics and gynaecology: Is this the way forward? In Vivo [Internet]. 2019;33(5):1547–51. Available from: http://dx.doi.org/10.21873/invivo.11635
3. Yaseen I, Rather RA. A theoretical exploration of artificial intelligence's impact on feto-maternal health from conception to delivery. Int J Womens Health [Internet]. ;16:903–15. Available from: http://dx.doi.org/10.2147/IJWH.S454127
4. Ramakrishnan R, Rao S, He J-R. Perinatal health predictors using artificial intelligence: A review. Womens Health (Lond Engl) [Internet]. 2021;17:17455065211046132. Available from: http://dx.doi.org/10.1177/17455065211046132
5. Ciecierski-Holmes T, Singh R, Axt M, Brenner S, Barteit S. Artificial intelligence for strengthening healthcare systems in low- and middle-income countries: a systematic scoping review. NPJ Digit Med [Internet]. 2022;5(1):162. Available from: http://dx.doi.org/10.1038/s41746-022-00700-y
6. Fritsch SJ, Blankenheim A, Wahl A, Hetfeld P, Maassen O, Deffge S, et al. Attitudes and perception of artificial intelligence in healthcare: A cross-sectional survey among patients. Digit Health [Internet]. 2022;8:20552076221116772. Available from: http://dx.doi.org/10.1177/20552076221116772
7. Oh S, Kim JH, Choi S-W, Lee HJ, Hong J, Kwon SH. Physician confidence in artificial intelligence: An online mobile survey (preprint) [Internet]. JMIR Preprints. 2018. Available from: http://dx.doi.org/10.2196/preprints.12422

8. Chew HSJ, Achananuparp P. Perceptions and needs of artificial intelligence in health care to increase adoption: Scoping review. J Med Internet Res [Internet]. 2022;24(1):e32939. Available from: http://dx.doi.org/10.2196/32939
9. Wilson L, Marasoiu M. The development and use of chatbots in public health: Scoping review. JMIR Hum Factors [Internet]. 2022;9(4):e35882. Available from: http://dx.doi.org/10.2196/35882
10. Baker B, Yang I. Social media as social support in pregnancy and the postpartum. Sex ReprodHealthc [Internet]. 2018;17:31–4. Available from: http://dx.doi.org/10.1016/j.srhc.2018.05.003
11. Wong J, Foussat AC, Ting S, Acerbi E, van Elburg RM, Mei Chien C. A chatbot to engage parents of preterm and term infants on parental stress, parental sleep, and infant feeding: Usability and feasibility study. JMIR Pediatr Parent [Internet]. 2021;4(4):e30169. Available from: http://dx.doi.org/10.2196/30169
12. Prakash AV, Indian Institute of Technology Kharagpur, Das S, Indian Institute of Technology Kharagpur. Intelligent Conversational Agents in Mental Healthcare Services: A Thematic Analysis of User Perceptions. Editor Introd [Internet]. 2020;12:1–34. Available from: http://dx.doi.org/10.17705/1thci.12201
13. Khan M, Khurshid M, Vatsa M, Singh R, Duggal M, Singh K. On AI Approaches for Promoting Maternal and Neonatal Health in Low Resource Settings: A Review. Front Public Health. 2022;10. Available from: http://dx.doi.org/10.3389/fpubh.2022.880034
14. Zayyad MA, Toycan M. Factors affecting sustainable adoption of e-health technology in developing countries: an exploratory survey of Nigerian hospitals from the perspective of healthcare professionals. PeerJ [Internet]. 2018;6(e4436):e4436. Available from:
15. http://dx.doi.org/10.7717/peerj.4436
16. Khan M, Khurshid M, Vatsa M, Singh R, Duggal M, Singh K. On AI approaches for promoting maternal and neonatal health in low resource settings: A review. Front Public Health [Internet]. 2022;10:880034. Available from: http://dx.doi.org/10.3389/fpubh.2022.880034
17. Chaves AP, Egbert J, Hocking T, Doerry E, Gerosa MA. Chatbots language design: The influence of language variation on user experience with tourist assistant chatbots. ACM Trans Comput Hum Interact [Internet]. 2022;29(2):1–38. Available from: http://dx.doi.org/10.1145/3487193
18. Armero W, Gray KJ, Fields KG, Cole NM, Bates DW, Kovacheva VP. A survey of pregnant patients' perspectives on the implementation of artificial intelligence in clinical care. J Am Med Inform Assoc [Internet]. 2022;30(1):46–53. Available from: http://dx.doi.org/10.1093/jamia/ocac200
19. Rodrigues SM, Kanduri A, Nyamathi A, Dutt N, Khargonekar P, Rahmani AM. Digital health-enabled community-centered care: Scalable model to empower future community health workers using human-in-the-loop artificial intelligence. JMIR Form Res [Internet]. 2022;6(4):e29535. Available from: http://dx.doi.org/10.2196/29535
20. Islam MN, Mustafina SN, Mahmud T, Khan NI. Machine learning to predict pregnancy outcomes: a systematic review, synthesizing framework and future research agenda. BMC Pregnancy Childbirth [Internet]. 2022;22(1):348. Available from: http://dx.doi.org/10.1186/s12884-022-04594-2
21. Lawrence ER, Klein TJ, Beyuo TK. Maternal mortality in low and middle-income countries. ObstetGynecol Clin North Am [Internet]. 2022;49(4):713–33. Available from: http://dx.doi.org/10.1016/j.ogc.2022.07.001

This article may be cited as: Gul H., Gul H., Rehman F., Begum T., Knowledge, Attitudes and Acceptance of Artificial Intelligence Assisted Antenatal care Among Pregnant Women: A Cross-Sectional Study**.** Pak J Med Health Sci, 2023; 18(1): 994-998.