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Evaluating the application and clinical practice of adapted national preeclampsia and eclampsia guideline; a cross-sectional study from Iran

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Abstract

Background Hypertensive disorders during pregnancy (HDP) are a significant cause of maternal mortality. The present study examined the extent of preeclampsia and eclampsia guideline use across different healthcare provider groups, aiming to provide evidence-based recommendations for better guideline implementation.

Methods A cross-sectional study was conducted from 2021-10-04 to 2022-04-04. Participants were maternal health providers from 63 medical universities in the country. For evaluating clinical applicability of the guideline, an online questionnaire developed. Questionnaire was designed to evaluate the *Implementation, Usability, Validity, Applicability, Accommodation, and Evaluation* of national guideline. The mean score for each question was calculated and categorized in unfavorable, relatively favorable, and favorable values. The online questionnaire was delivered to the all-guideline users. The answered questionnaires were sent back to the research team after a week.

Results Totally, 1,283 health care providers as the respondents completed the questionnaires. The ways to access the guideline that were expressed by the participants were: printed book in 57.9%, medical websites in 11.2%, CDs in 10.5%, and posters, bulletins, and brochures in 20.4%. The results delineated that general practitioner had the highest scores related to the majority of domains consisting of *Implementation, Usability, Evaluation, and Validity* than Behvarz (community health workers in the rural and urban healthcare centers), midwife, and obstetrician groups ($p < 0.01$). The results showed that mother's non-compliance, non-practical content of guideline, and lack of facilities were the most important reported challenges in guideline implementation.

Conclusion To effectively enhance the national preeclampsia guideline, it is critical to adopt a structured approach based on feedback from diverse healthcare providers. Key areas identified for improvement include ensuring comprehensive guideline awareness through better distribution, enhancing usability by simplifying language and offering quick-reference tools, regularly updating the guideline with new research, adapting it for varied clinical

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environments, accommodating the specific needs of different provider groups, and establishing a continuous evaluation mechanism through feedback loops. These steps aim to refine the guideline's practicality, reliability, and comprehensiveness in managing preeclampsia across diverse healthcare settings.

Keywords Preeclampsia, Eclampsia, Guideline, Health plan implementation

Introduction

Hypertensive disorders during pregnancy (HDP) are a significant cause of maternal mortality worldwide, contributing to an estimated 62,000 to 77,000 deaths annually and accounting for 18% of all maternal deaths [1]. HDP not only poses serious risks of severe morbidity and long-term disability but also result in high rates of maternal and fetal mortality [2]. While gestational hypertension is the most prevalent HDP, preeclampsia remains the most challenging to manage [3]. Preeclampsia, a progressive disorder affecting multiple systems, is characterized by the sudden onset of hypertension and proteinuria or hypertension with significant end-organ dysfunction, with or without proteinuria typically occurring after 20 weeks of gestation or postpartum [4, 5]. Eclampsia, which manifests as generalized tonic-clonic seizures or coma in patients with preeclampsia or gestational hypertension, adds further complexity and risk [6].

Both preeclampsia and eclampsia contribute significantly to preterm birth, cesarean deliveries, long-term maternal cardiovascular complications, and perinatal mortality [7]. Early diagnosis, along with prompt and appropriate management, including timely delivery is essential in mitigating the severe consequences of these conditions [8]. Clinical guidelines are instrumental in improving healthcare quality by guiding the planning, delivery, and evaluation of care. Specifically, preeclampsia and eclampsia guidelines provide healthcare providers with the tools for timely diagnosis and effective management, enhancing pregnancy outcomes [9]. Additionally, guidelines serve to direct healthcare resources toward evidence-based practices, optimizing patient care [10].

The adoption of clinical guidelines often requires shifts in healthcare providers' practices, a critical step toward improved care quality [11]. Effective guideline implementation depends on several factors, including the specific content, the healthcare providers themselves, the operational environment, and individual patient needs. The likelihood of successful implementation increases when guidelines are aligned with key enabling factors [12]. Improving guideline applications not only enhances care quality but also maximizes the returns on investments made by healthcare organizations worldwide to develop these standards [13].

This study, the first nationwide investigation in Iran focused on the assessment of healthcare providers' ability to apply preeclampsia and eclampsia guidelines (Supplementary File 1). Our research examines the extent of

guideline use across different healthcare provider groups, aiming to provide evidence-based recommendations for better guideline implementation and to address related barriers like disbelief in guideline, non-practical content of guideline, mother's non-compliance, and lack of facilities.

Materials and methods

A cross-sectional study was conducted at country level from 2021-10-04 to 2022-04-04. Participants were maternal health providers from 63 medical universities in the country. They were categorized in different stratified groups including obstetricians, general practitioners, midwives, and Behvarzes. A Behvarz is defined as a community health worker crucial to the delivery of health services at the grassroots level. Trained over two years in public health fundamentals, Behvarzes operate out of local health houses serving communities of about 1,500 people each. Their primary duties include providing preventive healthcare, basic medical services, health education, and vaccinations. They also engage in data collection to monitor community health trends and mobilize local resources to support health initiatives. This role has significantly contributed to improved health outcomes, particularly in rural areas, by enhancing access to healthcare and promoting health education.

The minimum sample size was considered 384 based on the assumption of 50% as the probability of having a good acceptance for hypertensive disorder-guidelines application in the pregnancy, using formula with a 95% confidence interval (CI) and 5% of accuracy rate [14, 15]. For evaluating clinical applicability of preeclampsia guideline, an online questionnaire (composed of 15 questions) was developed using experts' views, available related tools, and documents (Supplementary File 2). Questionnaire was designed to evaluate the *Implementation* (questions 1, 9, &10), *Usability* (questions 2 & 4), *Validity* (question 3), *Applicability* (questions 11,12, &13), *Accommodation* (questions 7 & 8), and *Evaluation* (questions14 & 15) of national guideline [16, 17]. Participants' responses were categorized using the four items with following rating scores; 1 (no); 2 (yes in few cases); 3 (yes in most cases); 4 (completely yes). After two weeks on-line gathering questionnaire, the mean score for each question was calculated and categorized in unfavorable (mean scores < 2), relatively favorable (mean scores 2–3), and favorable (mean scores > 3) values.

The online questionnaire was delivered to the administrative offices of included medical universities in the country to distribute it among all guideline users. The answered questionnaires were sent back to the research team after a week.

Statistical analysis

Qualitative and quantitative variables related to the frequency of implementing guideline and scores of questions were demonstrated using number (percent) and mean (SD), respectively. The T-Student and One-way ANOVA tests were also used to compare different variables between respondent participants. The collected data was analyzed using the software SPSS statistics version 26. P- Values <0.05 were considered statistically significant.

Results

Totally, 1,283 health care providers as the respondents including 111 obstetricians (mean age of 40.26 ± 7.41 years), 386 general practitioners (mean age of 34.86 ± 9.22 years), 573 midwives (mean age of 36.22 ± 7.04 years), and 213 Behvarzes (mean age of 35.93 ± 7.03 years) from 58 medical universities completed the checklist. About 90% of participants ($n = 1153$) were female. The ways to access the guideline that were expressed by the participants were: printed book in 57.9%, medical websites in 11.2%, CDs in 10.5%, and posters, bulletins, and brochures in 20.4%. Detailed information related to the frequencies of participants' responses to the questions are presented in Supplementary File 3.

Table 1 shows the mean scores of responses to each question. Moreover, analyses were performed to compare the mean scores of domains between the respondent groups. The results delineated that general practitioner had the highest scores related to the majority of domains consisting of *Implementation, Usability, Evaluation, and*

Validity than Behvarz, midwife, and obstetrician groups ($p \leq 0.01$).

Of all participants, 15.1% and 1.3% were Behvarzes who worked in the rural and urban health centers, respectively. Assessing the views of Behvarzes, the results showed that the mean scores of responses to questions 11 and 13 were in favorable range and the mean scores related to questions 10, 12, 14, 15 were in the relatively favorable domain. On the other hand, the *Accommodation, Validity, and Usability* scores based on the responses to questions 2,3,4,7 showed unfavorable values. Further analyses showed a significant difference between the Behvarz groups who worked at urban and rural health centers regarding their knowledge for diagnosis of preeclampsia ($p = 0.039$); more Behvarzes from urban health centers in response to question 12 reported that their knowledge for diagnosis of preeclampsia was enough (Table 2).

Concerning general practitioners' opinions, the responses associated with question 11 were mostly favorable. Moreover, the mean scores related to questions 3, 7,8,14, and 15 showing the *Evaluation, Accommodation, and Validity* of guideline, were in categorization of relatively favorable (scores 2.03 to 2.47). Comparing the mean scores of general practitioners' views working at different types of healthcare centers, the results showed that employed doctors at tertiary care hospitals had the highest scores of guideline *Accommodation* ($p < 0.05$). Of all general practitioners, most doctors at the secondary care hospitals also favorably responded to question 2 that showed the content of guideline was clear, simple, and usable ($p = 0.022$). Detailed data are shown in Tables 1 and 3.

Evaluating the midwives' views (Table 4), the results showed that the majority of them, working in urban health centers, primary, secondary, and tertiary hospitals, responded unfavorably to the different questions of

Table 1 Comparison of participants' views regarding clinical applicability of preeclampsia guideline

Domains	Questions	Behvarzes	General practitioners	Midwives	Obstetricians	P value*
Implementation	Q1	1.97 ± 0.98	2.01 ± 0.87	1.64 ± 0.78	1.81 ± 0.72	$p < 0.001$
	Q9	1.99 ± 0.85	2.17 ± 0.85	1.96 ± 0.81	1.95 ± 0.63	0.001
	Q10	2.02 ± 0.93	1.84 ± 0.92	1.59 ± 0.77	1.66 ± 0.71	$p < 0.001$
Usability	Q2	1.81 ± 0.83	1.86 ± 0.74	1.68 ± 0.71	1.76 ± 0.70	0.001
	Q4	1.76 ± 0.76	1.99 ± 0.78	1.70 ± 0.71	1.77 ± 0.72	$p < 0.001$
Validity	Q3	1.69 ± 0.75	2.03 ± 0.75	1.73 ± 0.73	1.86 ± 0.68	$p < 0.001$
Applicability	Q11	3.51 ± 0.95	3.67 ± 0.75	3.67 ± 0.75	3.64 ± 0.77	0.075
	Q12	2.03 ± 0.93	1.46 ± 0.61	1.50 ± 0.63	1.22 ± 0.42	$p < 0.001$
	Q13	3.12 ± 1.03	1.68 ± 0.73	1.10 ± 0.93	1.39 ± 0.64	$p < 0.001$
Accommodation	Q7	1.87 ± 0.92	2.23 ± 0.98	1.84 ± 0.91	2.34 ± 1.09	$p < 0.001$
	Q8	1.77 ± 0.82	2.14 ± 0.93	1.81 ± 0.84	2.22 ± 1.01	$p < 0.001$
Evaluation	Q14	2.29 ± 1.04	2.47 ± 1.08	2.10 ± 1.08	2.24 ± 1.23	$p < 0.001$
	Q15	2.15 ± 1.05	2.45 ± 1.09	1.97 ± 1.01	2.41 ± 1.21	$p < 0.001$

*One-way ANOVA test

Table 2 Views of behvarzes regarding clinical applicability of preeclampsia guideline

Domains	Questions	Behvarz		P value*
		Rural health centers	Urban health centers	
Implementation	Q1	1.98±0.98	1.83±0.92	0.068
	Q9	1.99±0.84	2±0.97	0.065
	Q10	2.01±0.93	2.11±0.96	0.067
Usability	Q2	1.82±0.82	1.72±0.82	0.066
	Q4	1.76±0.75	1.72±0.89	0.068
Validity	Q3	1.69±0.74	1.72±0.82	0.065
Applicability	Q11	3.49±0.96	3.61±0.84	0.073
	Q12	2.03±0.93	2.05±0.99	0.039
	Q13	3.11±1.05	3.22±0.94	0.060
Accommodation	Q7	1.88±0.92	1.77±0.87	0.104
	Q8	1.74±0.80	2±0.97	0.096
Evaluation	Q14	2.27±1.03	2.55±1.09	0.116
	Q15	2.14±1.03	2.27±1.22	0.120

*Student T-test

checklist (65.9 to 94.2%). Interestingly, the most midwives (90.8%) at different health centers favorably responded to question 11 showing that they had research or published articles related to the preeclampsia. Furthermore, of all midwives, those who worked at the urban health center and primary healthcare hospitals had the highest scores (relatively favorable) related to question 13 ($p < 0.001$) and question 7 ($p = 0.008$), respectively.

Based on the results (Table 5), question 11 (presenting guideline *Applicability*) was the only question that included obstetricians from urban health centers, primary, secondary, and tertiary hospitals favorably responded to it. Analyses of data showed a significant difference between the scores related to question 9 showing

guideline *Implementation* ($p = 0.011$) among obstetricians; the obstetricians working in the primary healthcare hospitals had the highest scores compared to their colleagues at the secondary and tertiary hospitals.

Obtained information associated with responses to question 6 is demonstrated in Figs. 1 and 2. The results showed that mother's non-compliance and lack of facilities were the most important reported challenges in guideline implementation. General practitioners and Behvarzs were the most respondents that frequently reported these challenges, respectively. About half of midwives also pointed to these barriers as the main challenges of guideline implementation. Although "*My disbelief in guideline*" was not a main reported challenge, the obstetricians showed the highest rate by 1.8% compared to the other respondents. "*Non-practical content of guideline*" was also the other challenge that more frequently was reported by general practitioners (10.7%) and obstetricians (7.2%). Concerning the site of healthcare provision, all general practitioners working in the secondary hospitals pointed to "*mother's non-compliance*" item, while the most midwives (71%) and obstetricians (62.2%) from primary hospitals, as well as Behvarzes (64.6) from the health centers reported that "*lack of facilities*" item were the main challenges for implementing the guideline.

Discussion

The findings from this study provide valuable insights into the challenges and successes of implementing the national preeclampsia and eclampsia guidelines in medical universities throughout Iran. In alignment with global research on guideline adherence, this study highlights the importance of addressing both healthcare provider and system-level factors to enhance guideline utilization.

Table 3 Views of general practitioners regarding clinical applicability of preeclampsia guideline

Domains	Questions	General practitioners				P value*
		Urban health centers	Primary care hospitals	Secondary care hospitals	Tertiary care hospitals	
Implementation	Q1	1.97±0.84	2.4±1.09	2.5±0.71	2.6±1.51	0.086
	Q9	2.15±0.84	2.45±0.88	2.5±0.71	2.6±1.14	0.260
	Q10	1.82±0.78	2.10±0.78	2±1.41	2.6±1.14	0.072
Usability	Q2	1.84±0.72	2.1±0.91	3±0.0	2.4±1.14	0.022
	Q4	1.98±0.76	2.2±0.95	1±0.0	2.4±1.34	0.110
Validity	Q3	2±0.73	2.35±0.98	2.5±0.71	2.6±1.14	0.051
Applicability	Q11	3.67±0.74	3.4±0.99	4±0.0	4±0.0	0.271
	Q12	1.44±0.59	1.75±0.78	1.5±0.71	1.6±1.34	0.181
	Q13	1.67±0.72	1.75±0.78	1.5±0.71	2.2±1.09	0.411
Accommodation	Q7	2.18±0.96	2.85±0.98	3±0.0	3.2±1.30	0.002
	Q8	2.11±0.91	2.45±0.99	2±0.0	3.2±1.30	0.029
Evaluation	Q14	2.45±1.07	2.5±1.19	2.5±2.12	3±1.41	0.745
	Q15	2.43±1.09	2.60±1.09	3±0.0	2.8±1.64	0.688

*One-way ANOVA test

Table 4 Views of midwives regarding clinical applicability of preeclampsia guideline

Domains	Questions	Midwife				P value*
		Urban health centers	Primary care hospitals	Secondary care hospitals	Tertiary care hospitals	
Implementation	Q1	1.66±0.79	1.67±0.76	1.39±0.56	1.56±0.72	0.092
	Q9	2.0±0.83	1.74±0.71	1.87±0.68	1.68±0.79	0.072
	Q10	1.59±0.78	1.67±0.76	1.53±0.73	1.5±0.63	0.789
Usability	Q2	1.71±0.71	1.63±0.67	1.55±0.71	1.43±0.51	0.205
	Q4	1.73±0.71	1.5±0.62	1.66±0.74	1.56±0.51	0.132
Validity	Q3	1.75±0.73	1.56±0.65	1.76±0.78	1.43±0.62	0.134
Applicability	Q11	3.65±0.78	3.8±0.62	3.62±0.88	3.62±0.81	0.662
	Q12	1.52±0.64	1.56±0.54	1.39±0.56	1.31±0.47	0.277
	Q13	2.23±0.94	1.83±0.73	1.53±0.66	1.5±0.52	P<0.001
Accommodation	Q7	1.79±0.91	2.26±0.88	1.87±0.89	1.62±0.72	0.008
	Q8	1.81±0.84	1.91±0.91	1.80±0.81	1.56±0.62	0.560
Evaluation	Q14	2.12±1.09	2.13±1.10	1.87±0.91	2.37±1.25	0.305
	Q15	1.98±1.04	2±1.05	1.73±0.75	2.18±1.11	0.263

*One-way ANOVA test

Table 5 Views of obstetricians regarding clinical applicability of preeclampsia guideline

Domains	Questions	Obstetricians				P value*
		Urban health centers	Primary care hospitals	Secondary care hospitals	Tertiary care hospitals	
Implementation	Q1	1.33±0.57	1.83±0.83	1.85±0.68	1.71±0.58	0.598
	Q9	1.33±0.57	2.08±0.59	2.03±0.75	1.53±0.51	0.011
	Q10	1±0.0	1.81±0.81	1.68±0.66	1.35±0.49	0.053
Usability	Q2	1.33±0.57	1.75±0.64	1.78±0.79	1.76±0.56	0.773
	Q4	2±1.73	1.83±0.73	1.79±0.68	1.53±0.62	0.465
Validity	Q3	1.66±1.15	2.03±0.6	1.85±0.71	1.53±0.62	0.092
Applicability	Q11	3.67±0.57	3.73±0.65	3.59±0.83	3.59±0.87	0.857
	Q12	1±0.0	1.27±0.45	1.22±0.42	1.17±0.39	0.683
	Q13	1±0.0	1.48±0.76	1.46±0.60	1.06±0.24	0.061
Accommodation	Q7	2±1.73	2.37±1	2.41±1.15	2.12±1.05	0.751
	Q8	2.33±1.53	2.24±1.01	2.28±1.08	2±0.71	0.799
Evaluation	Q14	1.67±1.15	2.35±1.25	2.20±1.20	2.23±1.34	0.805
	Q15	1.67±1.15	2.56±1.23	2.31±1.28	2.47±1.32	0.590

*One-way ANOVA test

Literature indicates that effective guideline adoption relies on resources, provider training, and an environment conducive to evidence-based practices [9].

The results of the present study delineated that the most frequently cited challenge, particularly among Behvarzes and midwives, was the lack of necessary facilities and resources. Previous studies have emphasized that limited access to resources, such as medical supplies and diagnostic tools, can severely hinder guideline implementation [18]. Addressing this through targeted investments such as providing adequate equipment, ensuring availability of essential medications, and upgrading infrastructure in underserved areas could significantly improve adherence and patient outcomes. This is especially crucial in rural and primary healthcare settings where resource disparities are more pronounced [19]. Moreover, the World Health Organization (WHO)

emphasizes the role of resource allocation in improving maternal health outcomes and ensuring equitable access to care [20].

Based on the results, the need for additional training and knowledge support, particularly among midwives and general practitioners, was another core finding. In similar studies, healthcare providers reported improved confidence and adherence to guidelines when ongoing education and training were provided. Enhancing training programs for healthcare providers across all levels, including refresher courses and continuous professional development initiatives, would improve familiarity with the guidelines and bridge knowledge gaps [21]. Evidence shows that well-designed training programs tailored to local needs significantly enhance the usability of clinical guidelines [3]. Additionally, embedding training within

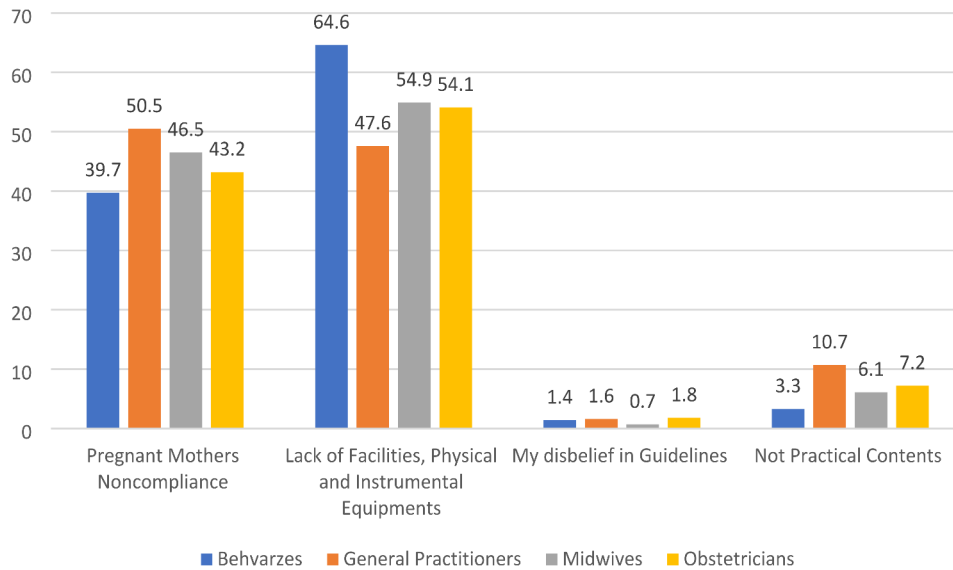


Fig. 1 Challenges in guideline implementation

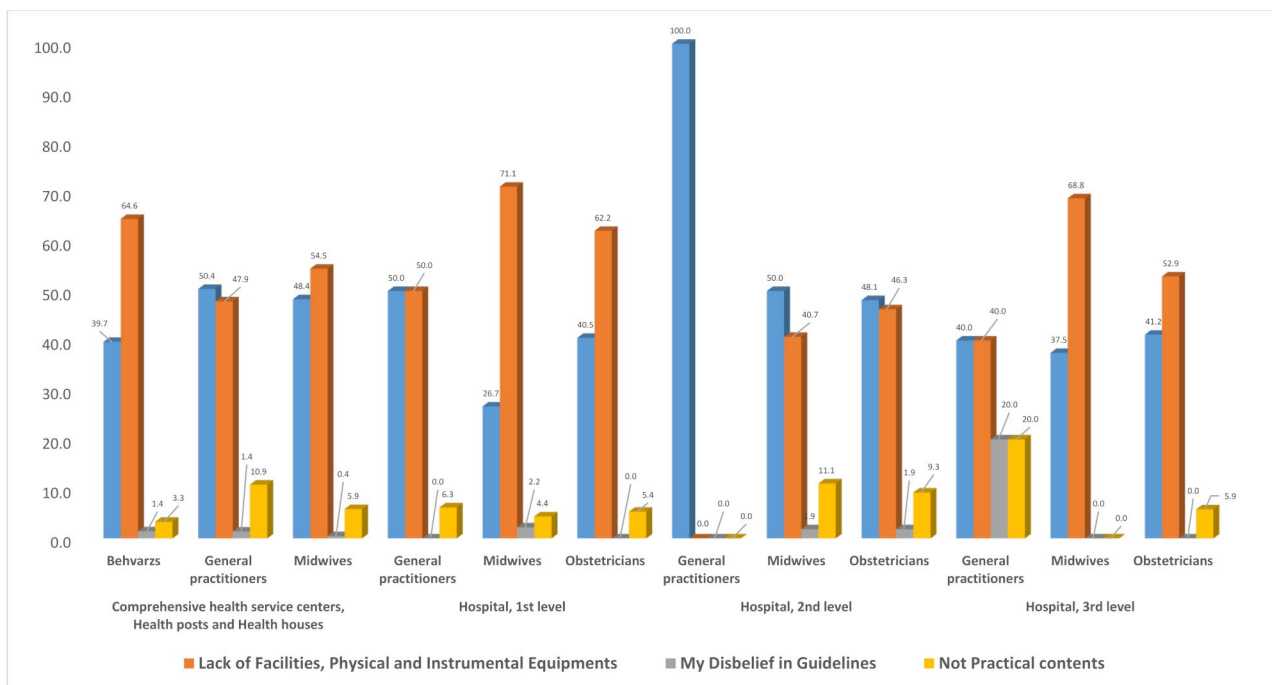


Fig. 2 The most important challenges reported by users according to educational level and field of service

the guideline implementation process could help reinforce the guidelines’ importance and practicality [9].

According to the results, cultural factors, particularly around patient compliance, also surfaced as a significant barrier. This aligns with literature suggesting that patient beliefs, economic conditions, and access to healthcare influence the success of health interventions [20]. Strategies such as incorporating culturally sensitive education programs and leveraging community health workers have been shown to improve patient compliance and health

outcomes [4]. Moreover, targeted efforts to address socio-economic challenges such as subsidies for treatment and transportation to healthcare facilities can further reduce disparities and promote equitable guideline implementation [22].

The results showed that a unique challenge identified among obstetricians was a minor degree of skepticism regarding the guidelines’ applicability. Similar findings are reported globally, where providers sometimes question guidelines that are not well-aligned with local

realities [23]. To address this, incorporating local evidence and examples within the guidelines and gathering feedback from frontline providers could foster a greater sense of relevance and ownership [24]. Additionally, establishing channels for providers to voice concerns and suggest adaptations may reduce skepticism and increase adherence.

Finally, the implications of practice and future research were significant for both healthcare practice and future research. Addressing the challenges identified in this study can strengthen the foundation for improved maternal health outcomes in Iran. Healthcare policymakers should consider developing a comprehensive strategy that includes resource enhancement, provider training, patient-centered educational initiatives, and localized guideline adaptations [25]. Future research could explore patient perspectives on guideline-based care, assess the long-term outcomes of improved guideline adherence, and investigate the feasibility of localized guideline modifications [26].

In summery, there were several challenges in implementation of national guideline. The most important were resource limitations, inadequate training on guideline content, patient's non-compliance, health provider's skepticism relevant to guidelines, and lack of infrastructure. Strengthening resource allocation, improving infrastructure, implementing a standardized supply chain, comprehensive and culturally sensitive training programs, and involving healthcare providers in the process of adapting and updating the guidelines may enhance guideline implementation.

Conclusion

To effectively enhance the national preeclampsia guideline, it is critical to adopt a structured approach based on feedback from diverse healthcare providers. Key areas identified for improvement include ensuring comprehensive guideline awareness through better distribution, enhancing usability by simplifying language and offering quick-reference tools, regularly updating the guideline with new research, adapting it for varied clinical environments, accommodating the specific needs of different provider groups, and establishing a continuous evaluation mechanism through feedback loops. These steps aim to refine the guideline's practicality, reliability, and comprehensiveness in managing preeclampsia across diverse healthcare settings.

Abbreviations

HDP Hypertensive disorders during pregnancy
WHO World Health Organization

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12884-025-07228-5>.

Supplementary Material 1

Supplementary Material 2

Supplementary Material 3

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Author contributions

Conception: M.B, N. Ch.Design: M.B, N. Ch.Supervision: N. Ch.Data collection: N. Ch. Z. Kh.Processing: N. Ch., M. B.Analysis and interpretation: Z. Kh., N. Ch.Literature review: M. Sh., Z. F., N. Ch.Writing: N. Ch., Z. F.Critical review: N. Ch., M. B.

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Data availability

Data is provided within the manuscript.

Declarations

Ethics approval and consent to participate

Ethics approval was obtained from the institutional review board of the Tehran University of Medical Sciences according to the Helsinki declaration (IR.TUMS.IKHC.REC.1400.168). Written informed consent was obtained from the participants.

Consent for publication

Written informed consent for publication of personal or clinical details was obtained from the participant.

Competing interests

The authors declare no competing interests.

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References

- Langlois EV, Mancuso A, Elias V, Reveiz L. Embedding implementation research to enhance health policy and systems: a multi-country analysis from ten settings in Latin America and the Caribbean. *Health Res Policy Syst*. 2019;17:1–14.
- De la Rosa A, Mordan J, Barinas I, Toribio M, Mancebo D, Rodríguez A, et al. Acceptability and adoption of clinical practice guidelines and treatment protocols on preeclampsia/eclampsia in the Dominican Republic. *Revista Panam De Salud Pública*. 2021;45:e8.
- Mol BW, Roberts CT, Thangaratnam S, Magee LA, De Groot CJ, Hofmeyr GJ. Pre-eclampsia. *Lancet*. 2016;387(10022):999–1011.
- Leeman L, Fontaine P. Hypertensive disorders of pregnancy. *Am Family Phys*. 2008;78(1):93–100.

5. Brown MA, Magee LA, Kenny LC, Karumanchi SA, McCarthy FP, Saito S, et al. Hypertensive disorders of pregnancy: ISSHP classification, diagnosis, and management recommendations for international practice. *Hypertension*. 2018;72(1):24–43.
6. Magley M, Hinson MR. Eclampsia. 2020.
7. Henderson JT, Vesco KK, Senger CA, Thomas RG, Redmond N. Aspirin use to prevent preeclampsia and related morbidity and mortality: updated evidence report and systematic review for the US Preventive Services Task Force. *JAMA*. 2021;326(12):1192–206.
8. Organization WH. WHO recommendations on antiplatelet agents for the prevention of pre-eclampsia. World Health Organization; 2021.
9. Shekelle P, Woolf S, Grimshaw JM, Schünemann HJ, Eccles MP. Developing clinical practice guidelines: reviewing, reporting, and publishing guidelines; updating guidelines; and the emerging issues of enhancing guideline implementability and accounting for comorbid conditions in guideline development. *Implement Sci*. 2012;7:1–7.
10. Fasting A, Hetlevik I, Mjølstad BP. Palliative care in general practice; a questionnaire study on the GPs role and guideline implementation in Norway. *BMC Fam Pract*. 2021;22:1–10.
11. van der Wees PJ, Jamtvedt G, Rebbeck T, de Bie RA, Dekker J, Hendriks EJ. Multifaceted strategies may increase implementation of physiotherapy clinical guidelines: a systematic review. *Australian J Physiotherapy*. 2008;54(4):233–41.
12. Francke AL, Smit MC, de Veer AJ, Mistiaen P. Factors influencing the implementation of clinical guidelines for health care professionals: a systematic meta-review. *BMC Med Inf Decis Mak*. 2008;8:1–11.
13. Willson ML, Vernooij RW, Gagliardi AR, Armstrong M, Bernhardsson S, Brouwers M, et al. Questionnaires used to assess barriers of clinical guideline use among physicians are not comprehensive, reliable, or valid: a scoping review. *J Clin Epidemiol*. 2017;86:25–38.
14. Araoye MO. Research methodology with statistics for health and social sciences. Ilorin: Nathadex Publisher. 2003;115(9):25–120.
15. Khan KS, Wojdyla D, Say L, Gülmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: a systematic review. *Lancet*. 2006;367(9516):1066–74.
16. Gagliardi AR, Brouwers MC, Bhattacharyya OK. The guideline implementability research and application network (GIRAnet): an international collaborative to support knowledge exchange: study protocol. *Implement Sci*. 2012;7:1–9.
17. Gagliardi AR, Brouwers MC, Palda VA, Lemieux-Charles L, Grimshaw JM. How can we improve guideline use? A conceptual framework of implementability. *Implement Sci*. 2011;6:1–1.
18. De la Rosa A, Mordan J, Barinas I, Toribio M, Mancebo D, Rodríguez A, Pacheco-Herrero M. Acceptability and adoption of clinical practice guidelines and treatment protocols on preeclampsia/eclampsia in the Dominican Republic. *Revista Panam De Salud Pública*. 2021;45:e8.
19. Langlois EV, Mancuso A, Elias V, Reveiz L. Embedding implementation research to enhance health policy and systems: a multi-country analysis from ten settings in Latin America and the Caribbean. *Health Res Policy Syst*. 2019;17:1–4.
20. World Health Organization. WHO recommendations on antiplatelet agents for the prevention of pre-eclampsia. World Health Organization; 2021. Dec 7.
21. Francke AL, Smit MC, de Veer AJ, Mistiaen P. Factors influencing the implementation of clinical guidelines for health care professionals: a systematic meta-review. *BMC Med Inf Decis Mak*. 2008;8:1–1.
22. Brown MA, Magee LA, Kenny LC, Karumanchi SA, McCarthy FP, Saito S, Hall DR, Warren CE, Adoyi G, Ishaku S. Hypertensive disorders of pregnancy: ISSHP classification, diagnosis, and management recommendations for international practice. *Hypertension*. 2018;72(1):24–43.
23. Steinberg E, Greenfield S, Wolman DM, Mancher M, Graham R, editors. Clinical practice guidelines we can trust. Volume 16. national academies; 2011 Jul.
24. Wang Z, Norris SL, Bero L. The advantages and limitations of guideline adaptation frameworks. *Implement Sci*. 2018;13:1–3.
25. Fervers B, Burgers JS, Haugh MC, Latreille J, Miika-Cabanne N, Paquet L, Coulombe M, Poirier M, Burnand B. Adaptation of clinical guidelines: literature review and proposition for a framework and procedure. *Int J Qual Health Care*. 2006;18(3):167–76.
26. Wang S, Zhang Y, Wen Z, Yang Y, Zhang Y, Geng Y, Liu Y, Zhang J. Development, evaluation, and implementation for guideline adaptation: a quality improvement protocol for the DELTA study in global health practice. *Health Res Policy Syst*. 2023;21(1):114.

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