

Preeclampsia prevention: a survey study on knowledge and practice among prenatal care providers in Ethiopia



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BACKGROUND: Knowledge and practice gaps among providers have been cited as factors behind the underuse of aspirin for preeclampsia prevention globally.

OBJECTIVE: This study aimed to determine the knowledge and practice levels of prenatal care providers at a national tertiary referral hospital in Ethiopia and its catchment health institutions.

STUDY DESIGN: This was a cross-sectional survey on the knowledge and practice of preeclampsia prevention through aspirin prophylaxis among prenatal care providers at St. Paul's Hospital Millennium Medical College (Ethiopia) and its catchment health institutions. Data were collected prospectively using a structured questionnaire on ODK (Get ODK Inc, San Diego, CA). The primary objective of our study was to determine the knowledge and practice levels among prenatal care providers. Data were analyzed using SPSS software (version 23; IBM, Chicago, IL). Simple descriptive analyses were performed to analyze the data. Proportions and percentages were used to present the results.

RESULTS: A total of 92 prenatal care providers working at 17 health institutions were approached, and 80 of them agreed to participate in the study, constituting a response rate of 87%. The mean scores of knowledge and practice of preeclampsia prevention using aspirin were 42.90 (± 0.13) and 45.8 (± 0.07), respectively. Most of the providers had poor knowledge (score of $< 50\%$) and poor practice (score of $< 50\%$). Among the 80 prenatal care providers, only 19 (23.8%) had good knowledge, and only 29 (36.3%) had good practice. More than half of the respondents (49/80 [61.3%]) mentioned "lack of national guidelines for use of aspirin in pregnancy" as the main factor that affected their practice of aspirin prophylaxis for preeclampsia prevention in pregnant women. Among the resources used as a reference for the practice of aspirin prophylaxis for preeclampsia prevention, International Federation of Gynecology and Obstetrics or World Health Organization guidelines (45/80 [56.3%]) were the most frequently used resources, followed by American College of Obstetricians and Gynecologists guidelines (36/80 [45.0%]) and clinical judgment (36/80 [45.0%]).

CONCLUSION: Our results support previous reports of significant knowledge-to-practice gaps in the use of aspirin prophylaxis for preeclampsia prevention among prenatal care providers. Moreover, the results underscore the need for immediate action in narrowing this gap among providers by availing practical national guidelines for preeclampsia prevention and in-service trainings.

Key words: aspirin, aspirin prophylaxis, preeclampsia in Ethiopia, preeclampsia, preeclampsia prevention, providers practice of aspirin

Introduction

Preeclampsia is a multisystem inflammatory syndrome, is often progressive, and is the second most common cause of maternal morbidity and mortality. It accounts for 6% of preterm births and 19% of medically indicated preterm

births.^{1,2} It is 1 of the 5 main causes of maternal mortality in developed countries.³ In a maternal death review conducted at a tertiary hospital in Ethiopia, preeclampsia was the most frequent cause of maternal death.⁴ Another systematic review and meta-analysis of 13

studies found that the prevalence of perinatal and maternal mortalities among pregnant women with hypertensive disorders (including preeclampsia) was higher than the rates reported from high-income and middle-income countries.⁵

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A formal ethical clearance letter was obtained from the institutional review board of St. Paul's Hospital Millennium Medical College. Written informed consent was obtained from all study participants.

The authors report no conflict of interest.

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All data generated or analyzed during this study are included in this published article.

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Why was this study conducted?

Currently, aspirin prophylaxis for preeclampsia prevention is underused globally, despite its effectiveness in preventing preeclampsia. Gaps in the knowledge and practice among care providers are among the main reasons. This study aimed to determine the knowledge and practice levels of prenatal care providers at a national tertiary referral hospital in Ethiopia and its catchment health institutions.

Key findings

The mean scores of knowledge and practice of preeclampsia prevention using aspirin were 42.90 (± 0.13) and 45.80 (± 0.07), respectively. Of 80 prenatal care providers, only 19 (23.8%) had good knowledge, and only 29 (36.3%) had good practice. More than half of the respondents (49/80 [61.3%]) mentioned “lack of national guidelines for the use of aspirin in pregnancy” as the main factor that affected their practice of aspirin prophylaxis for preeclampsia prevention in pregnant women.

What does this add to what is known?

Our results support previous reports of significant knowledge-to-practice gaps in the use of aspirin prophylaxis for preeclampsia prevention among prenatal care providers.

Currently, there is strong evidence that shows aspirin is effective at preventing preeclampsia in women with maternal risk factors for preeclampsia.^{6,7} Professional societies, such as the World Health Organization (WHO), the International Federation of Gynecology and Obstetrics (FIGO), the American College of Obstetricians and Gynecologists (ACOG), and the United States Preventive Services Task Force, recommend the use of low-dose aspirin to prevent preeclampsia in high-risk women.^{8–10} Despite such evidence, several international studies suggested a knowledge-to-practice gap in the use of aspirin prophylaxis to reduce the risk of preeclampsia.^{11,12}

In Ethiopia, although several studies have been conducted on risk factors, incidence, and perinatal and maternal outcomes of preeclampsia, little is known regarding the knowledge and practice of preeclampsia prevention among prenatal care providers. Our hospital, St. Paul's Hospital Millennium Medical College (SPHMMC), is one of the largest referral hospitals in Ethiopia, with more than a dozen catchment health centers and a referral site for

other several regional and district hospitals from around Ethiopia. The management of preeclampsia is one of the common reasons for referring patients to our hospital from the mentioned catchment areas. This study aimed to determine the level of knowledge and practice of preeclampsia prevention among prenatal care providers practicing at SPHMMC and its catchment health institutions.

Materials and Methods**Study design, study setting, and study period**

This was a cross-sectional survey study on knowledge and practice of preeclampsia prevention among prenatal providers serving at 17 public health institutions (3 hospitals and 14 catchment health centers) in Ethiopia. Among the 3 hospitals was SPHMMC, one of the largest tertiary referral hospitals and a leading medical college in Ethiopia, with various subspecialty care and training available in it, including an advanced Maternal-Fetal Medicine Unit. It is a national referral center for most of the Addis Ababa region and the largest region in Ethiopia (Oromia

region), including the 14 catchment health centers included in this study. The other 2 hospitals included in this study (Ras Desta Damtew Memorial Hospital and Dagmawi Menelik Hospital) are affiliates of this large referral hospital, SPHMMC. Most patients with preeclampsia from the mentioned catchment areas are referred to this tertiary center for better evaluation and management, most of the time in the third trimester or late second trimester of pregnancy. Although no published data has documented the missed opportunity for preeclampsia prevention among these preeclampsia patients, anecdotally, most candidates for preeclampsia prevention present to this hospital way beyond the ideal time for preeclampsia risk screening and the start of aspirin prophylaxis. In other words, as a tertiary center, this hospital accepts complicated obstetrical patients late in the second or third trimester of pregnancy (most patients pass their first trimester of pregnancy at the catchment health centers).

Participants

We approached prenatal providers practicing at 17 public health institutions in Ethiopia. The inclusion criteria were prenatal provider with at least 1 year of practice of prenatal care for pregnant mothers at respective health institution, currently in practice of prenatal care, midwife or resident physician or intern, and volunteering to participate in the study. The exclusion criteria were incomplete response and incomplete data.

Data collection and procedures

Data were collected using a structured questionnaire prepared in English on ODK (Get ODK Inc, San Diego, CA). The questionnaire was adopted from a survey study—Pregnancy, Race, and Aspirin - eXploration of Individuals' Stances survey at the University of California San Francisco California Preterm Birth Initiative. The questionnaire had 3 sections: preeclampsia prevention knowledge questions, practice questions, and questions on factors that would affect the knowledge and practice

of preeclampsia prediction and prevention. A nonrandom sampling technique was used to recruit the study subjects. Providers' willingness to participate in the study according to the inclusion and exclusion criteria was included in the study. Written informed consent was obtained from the study subjects. A formal ethical clearance letter was obtained from the institutional review board of SPHMMC.

Outcomes

The primary outcome of our study was the mean knowledge and practice scores of the participants on preeclampsia prevention. Knowledge and practice scores were further categorized into good knowledge, poor knowledge, fair knowledge, good practice, fair practice, and poor practice, which were defined as follows:

- Good knowledge: knowledge score of $\geq 60\%$
- Fair knowledge: knowledge score of $\geq 50\%$ to $<60\%$
- Poor knowledge: practice score of $<50\%$

- Good practice: knowledge score of $\geq 60\%$
- Fair practice: practice score of $\geq 50\%$ to $<60\%$
- Poor practice: practice score of $<50\%$

Statistical analysis

No sample size calculation was used. Respondents who volunteered to participate according to the inclusion and exclusion criteria were included. Each question in the knowledge and practice components of the questionnaire was scored individually and collectively to determine the mean knowledge and practice scores. Data were analyzed using the SPSS software (version 23; IBM, Chicago, IL). A simple descriptive analysis was employed. Proportions and frequency were used to present significant findings.

Role of the funding source

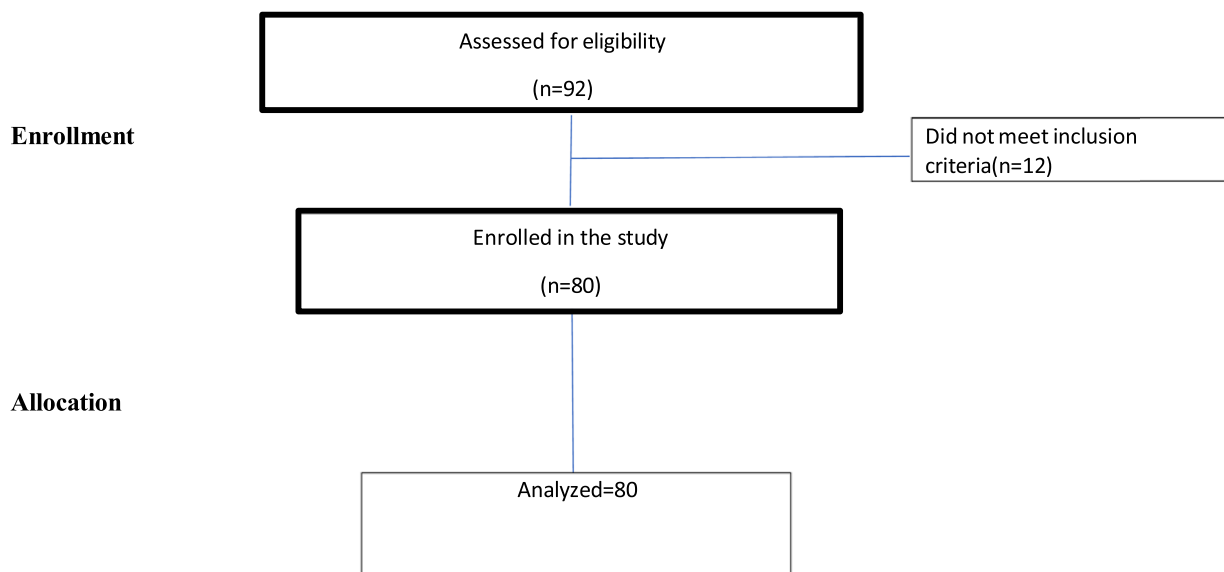
Apart from allocating a financial grant to support the conduct of this study, the funder (St. Paul Institute for Reproductive Health and Rights) had no input

into the study design, data interpretation, review, and approval of this report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

A total of 92 prenatal providers were approached for inclusion in this study. Of note, 12 prenatal providers did not volunteer to participate in the study and were excluded, making a response rate of 87%. A total of 80 prenatal providers (except 6 physicians and all midwives) from 3 tertiary hospitals and 14 catchment health centers were included in the final analysis (Figure 1). Based on the responses given by 80 providers to knowledge questions (Table 1), most providers knew that preeclampsia is preventable (only 16.5% of them did not know that preeclampsia is preventable). Moreover, 35 providers (43.8%) knew that preeclampsia can be predicted in the first trimester of pregnancy. Compared with the knowledge on preeclampsia screening through maternal risk factors, the providers' knowledge on the

FIGURE 1
CONSORT flow chart.



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TABLE 1

Prenatal care providers response to preeclampsia prevention knowledge questions at public health institutions in Ethiopia, 2023

Variables	Category	n	%	
Do you think preeclampsia is preventable?	No	13	16.3%	
	Yes	67	83.8%	
Do you know if any one of the following to be used for prediction of preeclampsia?	Mean arterial blood pressure?	No	4	5.0%
		Yes	76	95.0%
	Uterine artery doppler pulsatility index?	No	14	17.5%
		Yes	66	82.5%
	Maternal history?	No	5	6.3%
		Yes	75	93.8%
	Serum placental growth factor?	No	33	41.3%
		Yes	47	58.8%
	Serum PAPP-A?	No	51	63.7%
		Yes	29	36.3%
	When is the best time to predict preeclampsia	First trimester	35	43.8%
		Second trimester	40	50.0%
Third trimester		5	6.3%	
From your perspective, how does LOW DOSE ASPIRIN impact the risk of the following adverse pregnancy outcomes?	Risk of miscarriage	Decreases the Risk	17	21.3%
		No Impact on the Risk	8	10.0%
		Increases the Risk	12	15.0%
		Don't know	43	53.8%
	Risk of congenital anomalies	Decreases the Risk	17	21.3%
		No Impact on the Risk	14	17.5%
		Increases the Risk	6	7.5%
		Don't know	43	53.8%
	Risk of premature closure of the ductus arteriosus in the fetus	Decreases the Risk	18	22.5%
		No Impact on the Risk	9	11.3%
		Increases the Risk	15	18.8%
		Don't know	38	47.5%
	Risk of fetal growth restriction	Decreases the Risk	25	31.3%
		No Impact on the Risk	11	13.8%
		Increases the Risk	12	15.0%
		Don't know	32	40.0%
	Risk of stillbirth and neonatal death	Decreases the Risk	25	31.3%
		No Impact on the Risk	9	11.3%
		Increases the Risk	13	16.3%
		Don't know	33	41.3%
	Risk of preterm birth	Decreases the Risk	26	32.5%
		No Impact on the Risk	9	11.3%
		Increases the Risk	12	15.0%
		Don't know	33	41.3%
	Risk of preeclampsia	Decreases the Risk	35	43.8%
		No Impact on the Risk	8	10.0%
		Increases the Risk	5	6.3%
		Don't know	32	40.0%
	Risk of cesarean section	Decreases the Risk	28	35.0%
		No Impact on the Risk	10	12.5%
		Increases the Risk	7	8.8%
		Don't know	35	43.8%
	Risk of postpartum hemorrhage	Decreases the Risk	11	13.8%
		No Impact on the Risk	3	3.8%
		Increases the Risk	40	50.0%
		Don't know	26	32.5%

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use of serum analytes (placental growth factor [PGF] and serum Pregnancy associated plasma protein-A [PAPP-A]) for preeclampsia screening was low (93.8% of providers who knew that maternal history can be used to screen preeclampsia as opposed to 58.8% and 36.3% of providers who knew that PGF and serum

PAPP-A can be used for preeclampsia screening, respectively).

When it comes to the practice of preeclampsia prevention, only 45.0% of providers had recommended aspirin to pregnant patients to prevent preeclampsia in their last 12 months of practice (Table 2). Only 37 providers (46.3%)

would recommend starting aspirin in the correct gestational age range. Only 52.5% of providers considered that nulliparity would affect the likelihood that they would recommend aspirin for preeclampsia prevention.

The mean scores of knowledge and practice of preeclampsia prevention

TABLE 2

Prenatal care providers response to preeclampsia prevention practice questions at public health institutions in Ethiopia, 2023

Variables	Category	n	%	
In the last 12 months, have you ever recommended ASPIRIN to a pregnant patient to prevent complications in pregnancy?	No	44	55.0%	
	Yes	36	45.0%	
Do you recommend ASPIRIN to all of your pregnant patients?	No, I only recommend it to SOME of them	68	85.0%	
	Yes, I recommend it to ALL of them	12	15.0%	
Would you START a prenatal patient on ASPIRIN for the prevention of preeclampsia at the following gestational age ranges?	Before 8w0d	No	57	71.3%
		Yes	6	7.5%
		Don't Know	17	21.3%
	8w0d-11w6d	No	53	66.3%
		Yes	11	13.8%
		Don't Know	16	20.0%
	12w0d-15w6d	No	29	36.3%
		Yes	37	46.3%
		Don't Know	14	17.5%
	16w0d-19w6d	No	15	18.8%
		Yes	49	61.3%
		Don't Know	16	20.0%
	20w0d-23w6d	No	12	15.0%
		Yes	49	61.3%
		Don't Know	19	23.8%
	24w0d-27w6d	No	11	13.8%
		Yes	49	61.3%
		Don't Know	20	25.0%
	28w0d-31w6d	No	14	17.5%
		Yes	46	57.5%
		Don't Know	20	25.0%
	32w0d-35w6d	No	19	23.8%
		Yes	41	51.2%
		Don't Know	20	25.0%
	36w0d-39w6d	No	30	37.5%
		Yes	29	36.3%
		Don't Know	21	26.3%
At or after 40wks	No	37	46.3%	
	Yes	21	26.3%	
	Don't Know	22	27.5%	

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(continued)

TABLE 2

Prenatal care providers response to preeclampsia prevention practice questions at public health institutions in Ethiopia, 2023 (continued)

Variables	Category		n	%
How do each of the following patient characteristics impact the likelihood that you will recommend ASPIRIN?	Maternal age 35 years or older	Less Likely to Recommend	19	23.8%
		No Impact on Likelihood to Recommend	17	21.3%
		More Likely to Recommend	44	55.0%
	Nulliparous	Less Likely to Recommend	20	25.0%
		No Impact on Likelihood to Recommend	18	22.5%
		More Likely to Recommend	42	52.5%
	Multiple gestation	Less Likely to Recommend	20	25.0%
		No Impact on Likelihood to Recommend	16	20.0%
		More Likely to Recommend	44	55.0%
	Autoimmune disease	Less Likely to Recommend	18	22.5%
		No Impact on Likelihood to Recommend	20	25.0%
		More Likely to Recommend	42	52.5%
	Chronic hypertension	Less Likely to Recommend	21	26.3%
		No Impact on Likelihood to Recommend	13	16.3%
		More Likely to Recommend	46	57.5%
	Pregestational diabetes	Less Likely to Recommend	26	32.5%
		No Impact on Likelihood to Recommend	17	21.3%
		More Likely to Recommend	37	46.3%
	Kidney disease	Less Likely to Recommend	42	52.5%
		No Impact on Likelihood to Recommend	19	23.8%
		More Likely to Recommend	19	23.8%
	BMI greater than or equal to 30	Less Likely to Recommend	29	36.3%
		No Impact on Likelihood to Recommend	17	21.3%
		More Likely to Recommend	34	42.5%
	History of uncomplicated term delivery	Less Likely to Recommend	29	36.3%
		No Impact on Likelihood to Recommend	20	25.0%
		More Likely to Recommend	31	38.8%
	History of a stillbirth	Less Likely to Recommend	26	32.5%
		No Impact on Likelihood to Recommend	17	21.3%
		More Likely to Recommend	37	46.3%
History of small-for-gestational age and/or low birthweight baby	Less Likely to Recommend	22	27.5%	
	No Impact on Likelihood to Recommend	17	21.3%	
	More Likely to Recommend	41	51.2%	
History of preeclampsia	Less Likely to Recommend	17	21.3%	
	No Impact on Likelihood to Recommend	14	17.5%	
	More Likely to Recommend	49	61.3%	
Greater than 10 years since last delivery	Less Likely to Recommend	22	27.5%	
	No Impact on Likelihood to Recommend	19	23.8%	
	More Likely to Recommend	39	48.8%	
Family history of preeclampsia	Less Likely to Recommend	19	23.8%	
	No Impact on Likelihood to Recommend	18	22.5%	
	More Likely to Recommend	43	53.8%	
Low socioeconomic status	Less Likely to Recommend	20	25.0%	
	No Impact on Likelihood to Recommend	19	23.8%	
	More Likely to Recommend	41	51.2%	

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(continued)

TABLE 2**Prenatal care providers response to preeclampsia prevention practice questions at public health institutions in Ethiopia, 2023** (continued)

Variables	Category	n	%
How often do you tell patients that their MATERNAL AGE is part of the reason for your recommendation for aspirin when you are incorporating it into your decision making?	Always	4	9.1%
	Most of the time	17	38.6%
	About half the time	5	11.4%
	Sometimes	14	31.8%
	Never	4	9.1%
How often do you tell patients that their MATERNAL BMI is part of the reason for your recommendation for aspirin when you are incorporating it into your decision making?	Always	4	11.8%
	Most of the time	16	47.1%
	About half the time	3	8.8%
	Sometimes	9	26.5%
	Never	2	5.9%

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using aspirin were 42.90 (± 0.13) and 45.80 (± 0.07), respectively (Table 3). Most of the providers had poor knowledge (score of <50%) and poor practice (score of <50%). Of 80 prenatal providers, only 19 (23.8%) had good knowledge, and only 29 (36.3%) had good practice.

More than half of the respondents (49/80 [61.3%]) cited “lack of national guidelines for use of aspirin in pregnancy” as the main factor that affected their practice of aspirin for preeclampsia prevention in pregnant women (Table 4). Among the resources used as a reference for the practice of the use of aspirin for preeclampsia prevention, FIGO or WHO guidelines (45/80

[56.3%]) were the most frequently used resources, followed by ACOG guidelines (36/80 [45.0%]) and clinical judgment (36/80 [45.0%]). Baby aspirin (81 mg) was the most commonly used aspirin dosage for the practice of preeclampsia prevention by the providers, with a “yes” response rate of 38.8% (31/80), followed by other dosages (such as 100 mg) used by 30 of 80 providers (37.5%), with both low-dose aspirin (81 mg) and high dose aspirin (162 mg) found to have been practiced by 16 of 80 providers (20.0%). High-dose aspirin (2 baby aspirin dosages, 162 mg) was practiced by only 3 providers (3.8%). Close to one-third of the providers (31.3%) responded that patients never

follow their recommendations on using aspirin prophylaxis.

Discussion

Principal findings

In this survey, overall, the participants had poor knowledge and practice of preeclampsia prevention using aspirin prophylaxis for patients with moderate or high risk of preeclampsia. More than half of the respondents stated that the lack of national guidelines affected their practice of preeclampsia prevention. International guidelines (FIGO or WHO) were the most frequently used reference for practice by the participants.

Results

Low-dose aspirin has been the most widely studied preventive drug for preeclampsia.¹³ Evidences for the effectiveness of aspirin as prophylaxis for preeclampsia have been firmly established, are recommended by the WHO, and are used as a guiding practice in many developed countries.¹⁴ The FIGO 2019 pragmatic guidelines for the prevention and prediction of preeclampsia recommend that women identified as high risk should receive aspirin prophylaxis starting at 11 0/7 to 14 6/7 weeks of gestation to be taken every night until 36 weeks of gestation, when delivery occurs, or when preeclampsia is diagnosed.¹⁵ Nonadherence with prophylactic aspirin among high-risk pregnant

TABLE 3**Composite Knowledge and practice scores for prevention of preeclampsia among prenatal providers attending public health institution in Ethiopia (N=80), 2023**

Scores	Category	n	%
Knowledge scores	Mean		42.9 (+/-0.13)
	Poor < 50%	47	58.8
	Fair 50% - 60%	14	17.5
	Good 61%+	19	23.8
Practice scores	Mean		45.8 (+/-0.07)
	Poor < 50%	40	50.0
	Fair (50% - 60%)	11	13.8
	Good ($\geq 61\%$)	29	36.3

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TABLE 4

Reasons for practice of prevention of preeclampsia and resources utilized as a guide among prenatal providers practicing at public health institution in Ethiopia, 2023

Variable	Category	n	%		
Do the following reasons impact your practice around ASPIRIN in pregnant patients?	Not in your scope of care	No	35	43.8%	
		Yes	45	56.3%	
	Concern for fetal side effects	No	46	57.5%	
		Yes	34	42.5%	
	Concern for maternal side effects	No	45	56.3%	
		Yes	35	43.8%	
	Lack of sufficient evidence for the benefit of aspirin in pregnancy	No	36	45.0%	
		Yes	44	55.0%	
	Lack of national guidelines for use of aspirin in pregnancy	No	31	38.8%	
		Yes	49	61.3%	
	Other	No	72	90.0%	
		Yes	8	10.0%	
	Do you use the following to help you decide to which of your pregnant patients to recommend ASPIRIN?	American College of Obstetricians and Gynecologists / Society of Maternal-Fetal Medicine guidelines	No	33	41.3%
			Yes	36	45.0%
Not Applicable			11	13.8%	
International guidelines (e.g. World Health Organization, FIGO)		No	25	31.3%	
		Yes	45	56.3%	
		Not Applicable	10	12.5%	
Clinical judgment		No	32	40.0%	
		Yes	36	45.0%	
		Not Applicable	12	15.0%	
Regional or local guidelines (e.g. state collaborative, health system)		No	50	62.5%	
		Yes	13	16.3%	
		Not Applicable	17	21.3%	
Risk calculator (e.g. Fetal Medicine Foundation "Risk of pre-eclampsia" calculator)		No	49	61.3%	
		Yes	9	11.3%	
		Not Applicable	22	27.5%	
United States Preventive Services Task Force guidelines		No	47	58.8%	
		Yes	19	23.8%	
		Not Applicable	14	17.5%	
Other		No	58	72.5%	
		Yes	6	7.5%	
		Not Applicable	16	20.0%	
What DOSE of ASPIRIN do you typically prescribe?	81mg (1 baby aspirin) only	31	38.8%		
	162mg (2 baby aspirin) only	3	3.8%		
	Both 81mg (1 baby aspirin) and 162mg (2 baby aspirin)	16	20.0%		
	Other(100 mg. . . etc)	30	37.5%		
How often do patients follow your recommendation for ASPIRIN?	Always	6	7.5%		
	Usually	24	30.0%		
	About half the time	13	16.3%		
	Rarely	12	15.0%		
	Never	25	31.3%		

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women is associated with a higher incidence of preeclampsia.¹⁶ A survey study of 500 women with high-risk pregnancies found that aspirin was recommended for 13 of 269 patients (4.8%) with ≥ 2 moderate-risk factors.¹⁷ A sequential exploratory mixed method study surveyed 122 women with a recent high-risk pregnancy and found that consistent communication among healthcare providers and good patient-healthcare provider relationship were strongly associated with improved adherence ($\Phi = 0.7$ [$P = .04$] and $\Phi = 0.9$ [$P \leq .01$]) and play an important role in alleviating factors that had potentials to negatively influence adherence with aspirin in pregnancy.¹⁶ A qualitative study among Dutch pregnant women concluded that increased alertness of healthcare professionals would enable them to take active actions to improve pregnancy outcomes, including the intake of aspirin for preeclampsia prevention.¹⁸ Another study from Malawi found that healthcare workers and policy-level barriers affect the implementation of aspirin use for preeclampsia prevention in Malawian women.¹⁹ Close to one-third of the providers in our study reported that patients never followed their recommendations on using aspirin prophylaxis, demonstrating the need for improved patient-provider relationship in our settings to increase the adherence through effective communication.

Here, the overall knowledge and practice of preeclampsia prevention was low. The mean scores of knowledge and practice of preeclampsia prevention using aspirin were 42.90 (± 0.13) and 45.80 (± 0.07), respectively. Most of the providers had poor knowledge (score of $< 50\%$) and poor practice (score of $< 50\%$), with only 19 of 80 providers (23.8%) having good knowledge and 29 of 80 providers (36.3%) having good practice. More than half of the respondents in our survey study mentioned a lack of national guidelines detrimental to their practice of preeclampsia prevention. Among the resources used as a reference for the practice of use of aspirin for preeclampsia prevention, FIGO or WHO guidelines (45/80 [56.3%])

were the most frequently used resources by the participants in our study, followed by ACOG guidelines (36/80 [45.0%]) and personal clinical judgment (36/80 [45.0%]). The finding of low-level knowledge and practice of preeclampsia prevention among prenatal providers is consistent with reports from other Sub-Saharan countries. Among 379 care providers interviewed in a study from Nigeria, only 2.9% mentioned aspirin as a preventive intervention for preeclampsia, and only 9.0% of those who had knowledge of aspirin use mentioned having ever practiced it.²⁰ In another study, which included 136 health workers, most participants (63.0%) were found to be knowledgeable that preeclampsia is preventable, but only 18.0% of participants have ever practiced low-dose aspirin for preeclampsia prevention.²¹

Clinical implication

Our findings demonstrate the essence of immediate action by availing a national guideline for preeclampsia screening and prevention along with refreshment training for the prenatal providers on this topic. As discussed above, more than half of the respondents stated that the lack of national guidelines affected their practice of preeclampsia prevention. This could result in improving the very low scores of knowledge and practice of preeclampsia prevention among prenatal providers found in our study.

Research implication

We recommend further analytical studies that should focus on exploring the missed opportunity for harm reduction from preeclampsia through aspirin prophylaxis for pregnancy at risk of developing preeclampsia. Indirectly, the evidence generated will be useful in understanding the effect of the significantly low level of knowledge and practice of preeclampsia prevention among prenatal providers found in our study. Synergistically, all the evidences (results of our study plus the evidence of future research) can be used to inform many changes and improvements in maternal care.

Strengths and limitations

Although our study presents interesting results about prenatal providers' knowledge and practice of preeclampsia prevention in an Ethiopian setting, it has some limitations. Lack of analysis of factors associated with the knowledge and practice of providers and no proper sample size allocation are the main limitations of our study. We did not study the barriers to providers' access to information on standard recommendations for preeclampsia prevention, such as language and availability of an online risk calculator. Moreover, the sociodemographic characteristics of the study participants were not analyzed in our study.

Conclusion

Our results support previous reports of significant knowledge-to-practice gaps among prenatal care providers in the use of aspirin prophylaxis for preeclampsia risk reduction. More than half of the respondents stated that the lack of national guidelines affected their practice of preeclampsia prevention, implying the need for immediate action to avail a national guideline for the screening and prevention of preeclampsia. Equally important is in-service training for providers on this topic, including improving provider-patient relationship for better uptake of aspirin prophylaxis. ■

CRedit authorship contribution statement

Delayehu Bekele: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Wondimu Gudu:** Formal analysis, Validation, Writing – original draft, Writing – review & editing. **Lemi Belay Tolu:** Conceptualization, Data curation, Writing – original draft, Writing – review & editing. **Malede Birara:** Validation, Writing – original draft, Writing – review & editing. **Abraham Fessehaye Sium:** Conceptualization, Data curation, Formal analysis, Methodology, Validation, Writing – original draft, Writing – review & editing. ■

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