

Assessing the Knowledge and Attitudes of Preeclampsia in Pregnancy among Female Students in a Malaysian Private University

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ABSTRACT

Background: Preeclampsia is a hypertensive disorder of pregnancy that can result in serious maternal and fetal complications and often affects multiple organ systems due to systemic vasospasm and endothelial dysfunction. Despite its clinical importance, there is limited research on university students' understanding of preeclampsia. Poor knowledge may increase the risk of adverse maternal outcomes and influence health-seeking behaviors in future pregnancies.

Objectives: To assess the knowledge and attitudes towards preeclampsia and examine their association with sociodemographic factors among female students at the University of Cyberjaya.

Materials and methods: An analytical cross-sectional study was conducted among 421 female students using convenience sampling across faculties. A validated self-administered questionnaire was used to measure knowledge and attitudes towards preeclampsia. Data were analyzed using descriptive statistics to establish baseline knowledge and attitudes, and chi-square tests were performed to determine associations between sociodemographic factors and students' knowledge and attitudes towards preeclampsia.

Results: Most of the participants were undergraduates (98.8%) and pursued studies in non-medical faculties (78.1%). About 2/3rd of participants had low knowledge, and less than half (48.9%) had positive attitudes towards preeclampsia. Knowledge was significantly associated with race, age group, and faculty type; with Malay, Chinese, older, and medical students having better knowledge (P-value < 0.05).

Conclusion: Most female students reported low knowledge of preeclampsia with notable gaps in recognizing symptoms, risk factors, and complications. They also demonstrated mixed attitudes, reflecting a grey zone for health promotion. Nevertheless, higher education institutions, especially those with medical programs, should serve as platforms for health education to strengthen young women's preparedness for future maternal health challenges.

Keywords: Knowledge; Attitude; Female; Students; Preeclampsia.

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INTRODUCTION

Preeclampsia is a pregnancy complication involving new-onset hypertension, usually after 20 weeks of gestation [1, 2]. It is frequently associated with injury to other organ systems, most commonly the

liver and kidneys [3]. Preeclampsia is evidenced by the development of hypertension (blood pressure $\geq 140/90$ mm Hg) [4]. It can also present with severe headaches, visual changes, and upper abdominal pain [1].

Preeclampsia can cause severe complications in both mother and infant if not appropriately treated, such as eclampsia (seizures), preterm birth, and placental abruption [1]. The precise etiology of preeclampsia is unknown, but it is thought to be related to abnormalities in blood vessels and

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placental development [5]. Management usually involves close monitoring and may include premature delivery of the infant in severe cases [6].

Evidence shows that the prevalence of preeclampsia in Malaysia is low, with a prevalence of 1.6% reported in a study conducted in Kuala Lumpur from 2010 to 2020 [7, 8] and 1.4% for a study conducted by Mahamooth and Mas in 2018 in Hospital Universiti Sains Malaysia, Kelantan [7–9]. However, the rates might be different across regions and populations. Several risk factors for the Malaysian population have been identified in previous studies, such as nulliparity, prior history of preeclampsia, multiple pregnancies, and advanced maternal age. Other risk factors include diabetes mellitus, gestational hypertension, and chronic hypertension [7, 8]. Evidence also points to the unfavorable maternal and neonatal outcomes of preeclampsia, such as increased preterm delivery (67.7%), instrumental and cesarean delivery (74.7%), low neonatal birth weight (48.5%), and neonatal intensive care unit admission (19.8%) [7–9].

Ongoing research is evaluating the efficacy of different management protocols, such as screening and identifying women at risk, close monitoring, and initiating prophylactic treatment during prenatal care [8]. The Malaysian Clinical Practice Guidelines recommend these actions for the management of hypertensive disorders in pregnant women. Elevated levels of uric acid, chronic hypertension, and gestational diabetes mellitus were found to be significantly correlated with the severity of preeclampsia in a study conducted in Kelantan, Malaysia [9]. Monitoring uric acid levels during pregnancy can help prevent the serious consequences of preeclampsia and help detect it early [9]. Furthermore, studies revealed that only 18.4% of mothers in Malaysia were adequately informed about preeclampsia [7–9]. This emphasizes how important it is for medical professionals to learn more about preeclampsia [8–10].

Early health education is valuable for female university students, as it can influence their future health decisions. As many of them will become mothers in the future or serve as informal health advisors to friends and relatives, raising awareness early is a long-term investment for the maternal health of a country. The introduction of reproductive health education in tertiary institutions could improve knowledge of pregnancy complications such as preeclampsia and promote healthier habits in the years to come.

Although preeclampsia is a serious condition, little research has explored how well university students understand it. Most existing studies have focused on preeclampsia knowledge among pregnant mothers and on preconception health. Poor knowledge and attitudes could contribute to poor health-seeking practices and increase the likelihood of adverse maternal and fetal outcomes in future pregnancies. Since early knowledge and awareness help reduce risks that future mothers might face, this study aimed to assess the baseline level of knowledge and attitudes towards preeclampsia among female students at the University of Cyberjaya, and to examine how sociodemographic characteristics such as faculty of study, age, and ethnicity may affect these outcomes. To the best of our knowledge, this is the first study conducted to evaluate the knowledge and attitudes regarding preeclampsia among female university students in Malaysia. The study seeks to inform more targeted educational campaigns and public health interventions to reduce maternal complications in Malaysia.

MATERIALS AND METHODS

Study design and participants

A cross-sectional study was conducted among 421 female students at the University of Cyberjaya, Selangor, Malaysia. A validated questionnaire adapted from a previous study was administered to assess the students' knowledge and attitudes toward preeclampsia [11]. Participants were recruited through non-probability convenience sampling across different faculties of the university. The required sample size in this study was 421 based on the sample size calculation using the following formula: $n = (Z^2 * p * q) / e^2$. The inclusion criteria comprised female students aged 18 years or older, currently studying at the university (part-time or full-time), and willing to participate voluntarily with informed consent. Students with prior professional medical or nursing training (e.g., obstetrics or gynecology postings) were excluded to minimize bias, as formal knowledge could act as a potential confounder.

Study tools

Students were given a validated questionnaire via Google Forms and in-person. Since English is the most widely used language among students in Malaysian universities, regardless of their nationality or multiracial backgrounds, it was prepared in that language.

There are three sections to the questionnaire: Sociodemographic data, such as age, nationality, faculty, ethnicity, and study years, were collected in Section A.

With 15 items covering definition, symptoms, risk factors, complications, and prevention, Section B evaluated knowledge of preeclampsia. Response options were restricted to "Yes" or "No."

Ten items pertaining to risk concern, the perceived need for awareness, and willingness to learn or seek help were used in Section C to assess students' attitudes towards preeclampsia. Responses were graded on a three-point scale: "Agree", "Neutral", or "Disagree". Respondents were instructed to choose the option that best reflected their understanding and opinion.

Ethical considerations

Ethical approval for this research was obtained from the University of Cyberjaya Research Ethics Committee, with reference number: UOC/CRERC/ER/625. Participation was entirely voluntary, and informed consent was obtained from all respondents prior to data collection. Confidentiality and anonymity were strictly maintained by avoiding collection of personal identifiers. Participants were informed of their right to withdraw at any time without consequences.

Statistical analysis

Jamovi (version 2.4.8) was used to process and analyse the data. The categorical variables were presented as frequencies and percentages. The statistical significance was defined as $\alpha = 0.05$ (two-tailed), and precise P-values were reported after descriptive statistics were calculated and correlations between categorical variables were investigated using Pearson's Chi-square test.

RESULTS

Most respondents were aged between 18 and 22 years (68.4%) and unmarried (93.1%). By ethnicity, Indian students comprised the largest group (36.3%). Most of the par-

ticipants were full-time students (95.2%), nearly all were undergraduates (98.8%), and the majority were enrolled in non-medical faculties (78.1%) as shown in Table 1.

Only 52.7% of participants reported persistent headache as a symptom, while 43% indicated blurred vision, and 41.1% listed abdominal pain. Other symptoms like oedema, chest pain, and back pain were less recognized. Almost half of the respondents (47.3%) listed family history of gestational hypertension, while 44.7% were aware of the importance of hypertension during a previous pregnancy. Awareness of other risk factors like poor diet, no exercise, and drug abuse was less uniform, with many responding "I don't know" or listing incorrectly. Awareness of complications of preeclampsia was also low, with less than 40% of respondents listing fetal death (38.7%) and maternal death (38.0%). Attitudes of respondents towards preventive behavior for preeclampsia were also assessed. Most had positive attitudes: 64.6% thought preeclampsia can be prevented, 65.6% agreed that the risk can be minimized by avoiding excessive stress, and 72.9% thought early health service utilization during pregnancy can minimize the risk. Similarly, 72.0% agreed that routine antenatal check-ups help prevent preeclampsia (Table 2).

The findings revealed that most respondents ($n = 276$, 65.6%) had a low level of understanding about preeclampsia. Nearly half of the students showed a favorable attitude towards preeclampsia and the associated management or prevention measures (Table 3).

The analysis revealed significant associations between knowledge level and selected sociodemographic variables. Age group was significantly associated with knowledge level ($\chi^2 = 7.26$, $P\text{-value} = 0.027$). Students aged ≥ 23 years had higher proportions of moderate (22.6%) and high knowledge (21.1%) compared with those aged 18–22 years, among whom the majority (69.8%) fell into the low knowledge category. A significant relationship was also observed between faculty

Table 1. Sociodemographic characteristics of the 421 participants.

Sociodemographic Factors	Number	Percent
Age group per years		
18–22	288	68.4
≥ 23	133	31.6
Faculty		
Medical	92	21.9
Non-medical	329	78.1
Race		
Chinese	85	20.2
Indian	153	36.3
Malay	140	33.3
Others	43	10.2
Employment status		
Full-time student	401	95.2
Part-time student	20	4.8
Level of education		
Postgraduate	5	1.2
Undergraduate	416	98.8
Marital status		
Not married	392	93.1
Married	29	6.9

Table 2. Knowledge and attitude characteristics regarding preeclampsia of the 421 students.

No.	Variable	Answers	Frequency	Percent
Knowledge regarding preeclampsia				
Possible Signs and Symptoms				
1	Persistent headache	Yes	222	52.7
2	Oedema	Yes	144	34.2
3	Blurred vision	Yes	181	43.0
4	Chest pain	Yes	133	31.6
5	Abdominal pain	Yes	173	41.1
6	Nausea and vomiting	Yes	191	45.4
7	Back pain	Yes	152	36.1
Risk Factors				
8	Family history of gestational hypertension	Yes	199	47.3
9	Gestational hypertension in previous pregnancy	Yes	188	44.7
10	Obesity	Yes	172	40.9
11	Diabetes	Yes	187	44.4
12	Bad eating habits	Yes	154	36.6
13	Poor exercise habits	Yes	179	42.5
14	Abusing substances	Yes	125	29.7
15	Multiple births	Yes	139	33.0
Potential Complications				
16	Placental separation from the uterus	Yes	161	38.2
17	Abnormal kidney function	Yes	150	35.6
18	Heart-related disease	Yes	160	38.0
19	Fetal death	Yes	163	38.7
20	Maternal death	Yes	160	38.0
Attitude regarding preeclampsia				
Attitude towards preventive measures				
1	I believe that preeclampsia can be prevented	Agree	272	64.6
2	Avoiding excess stress reduces the chances of preeclampsia	Agree	276	65.6
3	Attending regular antenatal checkups helps prevent preeclampsia	Agree	303	72.0
4	Regular intake of fruits reduces the chances of preeclampsia	Agree	256	60.8
5	Reducing high caffeine consumption reduces the risk of preeclampsia	Agree	258	61.3
6	Use of unprescribed substances can increase the risk of preeclampsia	Agree	263	62.5
7	Seeking health services early in pregnancy reduces the risk of preeclampsia	Agree	307	72.9

background and knowledge level ($\chi^2 = 6.72$, $P\text{-value} = 0.035$). Medical faculty students reported a higher prevalence of high knowledge (22.8%) than non-medical students (14.6%), while low knowledge levels were more frequent among the latter (68.7%). Furthermore, race was significantly correlated with knowledge level ($\chi^2 = 20.0$, $P\text{-value} = 0.003$). Chi-

Table 3. Knowledge and attitude level regarding preeclampsia of the 421 participants.

Variable	Frequency	Percent
Knowledge level		
High	69	16.4
Moderate	76	18.0
Low	276	65.6
Attitude level		
Positive	206	48.9
Neutral	88	20.9
Negative	127	30.2

Table 4. Correlation between sociodemographic factors with knowledge level of the 421 students.

Variable	Knowledge level						χ^2	P-value
	High		Moderate		Low			
	Frequency	Percent	Frequency	Percent	Frequency	Percent		
Age group								
18–22	41	14.2	46	16.0	201	69.8	7.26	0.027
≥23	28	21.1	30	22.6	75	56.4		
Faculty								
Medical	21	22.8	21	22.8	50	54.3	6.72	0.035
Non-medical	48	14.6	55	16.7	226	68.7		
Race								
Chinese	19	22.4	20	23.5	46	54.1	20.0	0.003
Indian	15	9.8	22	14.4	116	75.8		
Malay	28	20.0	31	22.1	81	57.9		
Other	7	16.3	3	7.0	33	76.7		
Employment status								
Full-time student	68	17.0	73	18.2	260	64.8	2.44	0.295
Part-time student	1	5.0	3	15.0	16	80.0		
Level of education								
Postgraduate	0	0.0	2	40.0	3	60.0	2.20	0.332
Undergraduate	69	16.6	74	17.8	273	65.6		
Marital status								
Not married	63	16.1	70	17.9	259	66.1	0.70	0.705
Married	6	20.7	6	20.7	17	58.6		

nese and Malay students had relatively higher proportions of high knowledge (22.4% and 20.0%, respectively), while Indian students showed the highest prevalence of low knowledge (75.8%). Students categorized as “Other” races also predominantly reported low knowledge (76.7%). Employment status, level of education, and marital status were not statistically significantly associated with the knowledge level. Regarding attitude, all the studied variables were not significantly associated except for trace, which was significantly associated with attitude (Table 4).

DISCUSSION

Preeclampsia is a common cause of maternal morbidity and mortality worldwide, affecting an estimated 2-8% of pregnancies globally, with the figures rising to 10% in low-income countries [11–13]. Various studies have been conducted to evaluate the knowledge and awareness of preeclampsia among pregnant women [7–10] but the present study, to the best of our knowledge, is the first study being conducted to evaluate the knowledge and attitude toward preeclampsia in pregnancy among female students currently studying at the University

in Malaysia.

The result of this study is lower compared to a comparable study conducted in South Gonder zone, northwest Ethiopia, where 92 (22.45%), 200 (48.8%) and 118 (28.8%) of the study participants had poor, moderate, and good knowledge on preeclampsia, respectively [14]. In this present study, the majority (65.6%) of the participants had moderate knowledge, whereas a minority had good knowledge (16.4%). The same finding was observed in two other comparable studies that report the majority of the respondents have low knowledge towards preeclampsia [15, 16]. These findings are also lower than those of a study that was done in Kitwe, Zambia, on pregnancy-induced hypertension [17], but higher than the study that was conducted in a study that was done in Bangalore, India [18], about a 100 pregnant women were assessed using structured questionnaires on their knowledge levels regarding preeclampsia and it was reported that about 71% of women had moderately adequate knowledge, 28% of the women had inadequate knowledge whereas a percent had adequate knowledge of preeclampsia in that a very small number of women (1%) had adequate knowledge even though a huge

number (71%) had moderately adequate knowledge [19]. The discrepancy between studies may reflect differences in study populations, as women in this current study who are university students may have greater exposure to information due to higher education levels, younger age, and primarily urban residency. Additional factors, such as sample size, data collection methods, and inclusion criteria, may also contribute to the observed differences.

As for the signs and symptoms of preeclampsia, only 52.7% in the current study recognized persistent headache as a symptom, whereas 43% recognized blurred vision, and 41.1% recognized abdominal pain in our study. The other symptoms like oedema, chest pain, and back pain were less recognized. For example, only 34.2% rightly identified oedema, and chest pain was recognized by only 31.6% of the participants. This indicates a moderate awareness of clinical presentations of preeclampsia. These findings are inconsistent with the research by Gari et al. [20], Fondjo et al. [15], and Alsabi et al. [19], who reported that more than half of their study's participants recognized high blood pressure as a sign of preeclampsia but had limited awareness about other symptoms such as persistent headache, edema, blurred vision, chest and abdominal pain, nausea, vomiting, and back pain [19]. While for attitude, the mean score was 4.60 (SD = 2.43), about 48.9% or 206 respondents had a positive attitude towards preeclampsia. The same finding was observed in previous studies [16–20]. These results illustrate a similar trend of results irrespective of the geographical study area.

Previous studies have proven that awareness-raising is significantly linked with early recognition of pregnancy dangers, which, in turn, can avert hazardous complications [12, 21]. A study conducted in Indonesia demonstrated that adequate antenatal care attendance was significantly associated with improved awareness of pregnancy danger signs and greater utilization of healthcare childbirth services, likely due to counseling and health education provided during antenatal visits [22]. Another study in Australia also corroborated that expanding the coverage of prenatal care and the level of women's education raises mothers' awareness of the signs of childbirth dangers. In another study, it was noted that the awareness level was considerably linked with the age, education level, occupational status, and monthly household income of pregnant women [23]. Hence, the necessity of awareness-raising in pregnant women has been suggested before, and the need for interventions to raise awareness is, today, more than ever felt.

Despite continued research, early detection of preeclampsia is still challenging because of the lack of robust screening tests. Public awareness of the condition is also variable, particularly in populations with poor exposure to healthcare education. Research across various regions of the globe has demonstrated this fact. For instance, a study in the Andaman and Nicobar Islands revealed that more than half of the women interviewed were unaware of preeclampsia, and just a quarter had any significant knowledge regarding the condition [24]. The same patterns were observed in Ethiopia and Nigeria, where most women had insufficient knowledge of the condition and its danger [19, 25].

Results of the current study indicated that the type of faculty (medical versus non-medical faculty), race, and age groups were significantly related to having a high knowledge level of preeclampsia. Significant relation also observed between attitude toward preeclampsia and race. Regarding the age group, those aged 18–22 were more likely to have less knowledge about preeclampsia (P-value = 0.0027). This was

similar to the previous studies that younger women, particularly those never experienced pregnancy or clinical training, tend to have poor knowledge of pregnancy-related complications such as preeclampsia [15, 26]. The potential explanation for these results is that most younger students have not yet learned or even been exposed to reproductive health in depth, especially if they are not in medical courses.

There was a significant association between the faculty type and level of knowledge. Students from medical faculties had a better understanding of preeclampsia than non-medical students (P-value = 0.035). This was an anticipated result since the medical curriculum would naturally include subjects such as hypertensive disorder in pregnancy. In Italy, research conducted by Esposito et al. [27] Highlighted that the crucial determinant of maternal health knowledge is through healthcare education. Meanwhile, students from non-medical faculties might not be exposed to maternal health information unless they are exposed to external sources or third person experience. Aside from that, this result is aligned with research in Ethiopia, where the level of education and area of study affected awareness of hypertensive disorder in pregnancy [28, 29].

This research builds on the existing body of knowledge regarding knowledge and attitude towards preeclampsia. One of the research strengths was its sociodemographic representativeness, indicating how various determinants could shape awareness and perception. Data collected contributes value to existing literature and informs the creation of more comprehensive and focused health education interventions. However, several limitations of this study should be acknowledged. First, the cross-sectional design and the use of convenience sampling restrict the ability to establish causal relationships and may introduce sampling bias. Second, since the study was done at only one place, the results could be biased and may not apply to all Malaysian students. Third, the accuracy of the data may be affected by recall bias and socially desirable answers that result from using self-administered questionnaires. Fourth, the study was not conducted among pregnant women, which limited the ability to obtain real-time blood pressure measurements and directly correlate the findings with preeclampsia. Previous studies conducted among pregnant women have demonstrated that early-onset preeclampsia was significantly associated (P-value < 0.05) with higher mean and maximum systolic (SBP) and diastolic (DBP) blood pressure values [30].

Based on the limitations found, several suggestions for additional research can be made. First, researchers could examine how attitudes and knowledge evolve over time and determine potential cause-and-effect relationships by employing a longitudinal or cohort design. Second, to improve the representativeness and generalizability of the findings, future studies should use probability-based sampling techniques and include participants from different institutions in different parts of Malaysia.

CONCLUSION

The findings indicate that female students at the University of Cyberjaya generally demonstrated positive attitudes towards preeclampsia despite possessing limited knowledge, particularly regarding its symptoms and complications. These gaps underscore the need for targeted educational and awareness initiatives to improve understanding, promote early recognition, and support maternal and neonatal health out-

comes. Sociodemographic factors, particularly age, field of study, and race, were associated with variation in knowledge levels, whereas race emerged as the only factor significantly associated with attitudes towards preeclampsia. Collectively, these findings suggest that cultural background and academic exposure may play important roles in shaping awareness and perceptions of preeclampsia.

ETHICAL DECLARATIONS

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Ethics Approval and Consent to Participate

Ethical approval for this research was obtained from the University of Cyberjaya Research Ethics Committee, with reference number: UOC/CRERC/ER/625. Informed consent was obtained from all participants before participation.

Consent for Publication

It is approved to publish, as no individual personal data is included in this manuscript.

Availability of Data and Material

The data generated and analyzed during this study are available from the corresponding author upon reasonable request.

Competing Interests

The authors declare that there is no conflict of interest.

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Use of Artificial Intelligence

The authors affirm that they have used artificial intelligence tools only to make minor language editing and grammar improvements of this manuscript. The authors did all the scientific content, interpretation of findings, and final revisions.

Authors' Contributions

Abdalqader MA and Osman MT made the research proposal and the main editing. Chen H, Bin Zamri FI, A/L Chendrasegran SN, Bin Azhari AA, Sindhu AA, and Ahmed AA made significant, direct, and intellectual contributions to the design, implementation, and writing of this study. The authors have read and approved the final version of the manuscript.

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