

RESEARCH

Open Access



# Towards safer motherhood: a cross-sectional study of seatbelt practice and its correlates with pregnant front passengers in Samarinda, Indonesia

Ida Hayati<sup>1,2</sup>, Suzanna Daud<sup>3,4\*</sup>, Ilham Ameera Ismail<sup>4,5</sup>, Muhammad Syafie Mohd Rashid<sup>1</sup> and Zaliha Ismail<sup>1</sup>

## Abstract

**Background** The use of seatbelts in motor vehicles among pregnant women can reduce morbidity and mortality due to road traffic crashes; however, to date, there are no published studies on seatbelt usage among pregnant women in Indonesia. This research aims to promote the safety of pregnant women when using a motor vehicle. Its objective was to investigate the practices of seatbelt usage among pregnant front passengers and the associated factors.

**Methods** A cross-sectional study was conducted in Samarinda, Indonesia. Pregnant women were asked to complete a self-administered validated and published questionnaire, the SaPeIH-Q, which included sociodemographic information, and an assessment of knowledge, attitudes, and practices related to seatbelt usage among pregnant women. Multiple logistic regression (MLogR) was performed via SPSS version 27 to identify independent factors associated with seatbelt usage.

**Results** Among the 326 pregnant front passengers, only 34.7% used seatbelts, and only 39.3% correctly identified the placement of the three-point seatbelt. The practice of using seatbelts before pregnancy and knowledge of seatbelt usage were significantly associated with using seatbelts during pregnancy ( $p = 0.001$  and  $0.004$ , respectively).

**Conclusion** The seatbelt usage rate among pregnant front passengers was low. Pregnant front passengers who used seatbelts before pregnancy were more likely to use them during pregnancy, and pregnant women with good knowledge were more likely to use seatbelts during pregnancy. The rate of seatbelt use during pregnancy may improve with increasing knowledge of seatbelt usage and the use of seatbelts before pregnancy.

**Keywords** Seatbelts, Pregnancy, Knowledge, Practice

\*Correspondence:

Suzanna Daud  
suzanna@uitm.edu.my

<sup>1</sup>Faculty of Medicine, Universiti Teknologi MARA (UiTM), Sungai Buloh, Selangor, Malaysia

<sup>2</sup>Study Programme of Midwifery, Institute of Technology Health and Science, Wiyata Husada, Samarinda, East Kalimantan, Indonesia

<sup>3</sup>Department of Obstetrics and Gynaecology, Faculty of Medicine, Universiti Teknologi MARA (UiTM), Sungai Buloh Campus, Sungai Buloh 47000, Selangor, Malaysia

<sup>4</sup>Hospital Al-Sultan Abdullah, Universiti Teknologi MARA (UiTM), Puncak Alam, Selangor, Malaysia

<sup>5</sup>Department of Primary Care Medicine, Faculty of Medicine, Universiti Teknologi MARA (UiTM), Sungai Buloh, Selangor, Malaysia



© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

## Background

One of the indirect causes of maternal mortality and morbidity among pregnant women is road traffic crashes [1]. The other complications encountered after road traffic crashes include labour, premature labour, premature rupture of membranes (PROM), caesarean section, fetal death, and intrauterine bleeding [2].

Among the efforts made to reduce morbidity and mortality due to road traffic crashes was the introduction of three-point seatbelts. Seatbelts are designed with the aim of keeping the driver or passenger in their when braking suddenly or in the event of a collision [3]. The use of seatbelts is recommended, as it reduces fatal injuries from car crashes by half [4]. In Indonesia, the average annual rate of road fatalities has risen by 16.6% [5]. Alarmingly, according to observational data, from 2003 to 2007, all the fatalities resulting from crashes involving at least four-wheeled vehicles on the Semarang Toll Road, were those who did not wear seatbelts [6].

The compliance rate with three-point seatbelts among pregnant women traveling via motorized vehicles varies across countries. In countries where there was legislation making seat belt usage compulsory, such as Sweden, the United Kingdom, and Thailand, the rates were 98%, 74%, and 94%, respectively [7–9]. In areas where pregnant women were exempted from the legislation, such as Malaysia and Japan, the compliance rate was 43% and 38% respectively [10, 11].

In addition, the rate of correct usage of seatbelts also varies worldwide, such as, in Malaysia was 25% [10]. Iran (18%) [12], the United Kingdom (48%) [13], Sweden (61%) [14], United States of America (83%) [15] and Thailand (91%) [9].

To the best of our knowledge, no studies have investigated the use of seatbelts among pregnant women in Indonesia. Rear seatbelts have not been widely used in Samarinda in general. Furthermore, most pregnant women are passengers when travelling via car transportation. We aimed to promote the safety of pregnant women when using a motor vehicle. To achieve this, the present study was conducted. The objectives of this study were to investigate the practices of belt usage among pregnant front passengers and to identify the correlates that influence them. In our study, the front passenger is defined as the passenger who was not the driver; and occupied the seat next to the driver in a moving four-wheel vehicle.

## Methods

This study's objectives were to investigate the practices of seatbelt usage among pregnant front passengers and to identify the correlates that influence them.

## Study design

This was a cross-sectional study conducted at six obstetric clinics selected randomly from 33 obstetric clinics across six areas in Samarinda, Indonesia. Data collection was conducted from September 14th to November 30th, 2022. The total number of pregnant women who visited these clinics within one month was 3150. All pregnant women who visited these clinics travelled in cars as passengers, and were able to read and write in the Indonesian language were invited to participate.

The sample size was calculated via Epi Info (version 3) on the basis that the prevalence of pregnant women with knowledge of correct seatbelt use in pregnancy was 25% [10]; the attitudes of pregnant women who used seatbelts correctly were 79.8% [12], and the practice using the correct seatbelt in pregnancy was 69.4% [16]. Using a confidence interval (CI) of 95% and a margin of error of 5%, the minimum sample sizes calculated were 265, 296, and 230, respectively. Hence, the highest number was chosen, and to anticipate dropouts, the sample size was increased by 10% [17]. The final sample size was 326.

The sampling method employed was convenient sampling. Pregnant women who came to the research site and met the inclusion criteria were invited to participate. Informed consent was obtained from each participant after they were provided with an explanation of the purpose and method of the research. In addition, they were informed regarding which data would be identified and what would we do with the results.

The SaPeIH-Q, which was short for “Sabuk Pengaman pada Ibu Hamil - Questionnaire”; (which translated to “Seatbelt for pregnant women - Questionnaire”) was the research tool used in this study [18]. It is a self-administered questionnaire in the Indonesian language that was developed by the research team and has four components (demographics, knowledge, attitudes, and practices) for assessing knowledge, attitudes, and practice of seatbelt usage among pregnant women. It was developed after a literature review was done and using the health belief model. Pictorial diagrams and questions were discussed and vetted by the research team. It is a valid and reliable questionnaire with Cronbach's alpha values of 0.931, 0.956, and 0.911 for the knowledge, attitude, and practice domains; respectively [18]. It had not been translated nor validated in the English Language.

The pregnant women were asked to provide demographic data in the form of age, occupation, ethnicity, education, income, distance from home to the clinic, gestational age, history of receiving information and sources of information about seatbelts, etc. The knowledge component consisted of 10 items and used a Likert scale with three answer choices (wrong, doubtful, and true). The obligation to use seatbelts and their purpose, type, and ability to use three-point seatbelts correctly were also

asked. The attitude component consists of 12 statements about the obligation to use seatbelts and their purpose, type, and ability to use three-point seatbelts correctly. The respondents were asked to answer on a five-point Likert scale (strongly disagree, disagree, doubtful, agree, and strongly agree). Finally, in the practice component, the pregnant women were asked about their practice of using seatbelts when they were drivers and front and rear passengers seated on a five-point Likert scale (never, rarely, doubtful, often, and always). They were also asked about the use of seatbelts before (recalled) and during pregnancy, as well as the reasons for using and not using them.

The knowledge and attitude categories were determined based on the Angoff cut-off point. The cut-off point for knowledge was 69.8%. Knowledge was categorized as either poor knowledge if it was less than 69.8% or good knowledge if it was greater than 69.8%. The Angoff cut-off point for attitude was 68.6%. Attitude was categorized as negative if the percentage of questions answered was less than 68.6% and positive if it was greater than 68.6%. The practice of seat belt usage was divided into two categories: never (never, rarely, and sometimes) and always (often and always) [18]. In this study, we used good knowledge and positive attitudes as references in logistic regression analysis.

The independent variables in this study consisted of demographic data (age, ethnicity, occupation, distance from home to the clinic, income, education, gestational age, history of receiving information on seatbelt usage), knowledge of seatbelt usage, attitudes toward seatbelt usage, and recalled practices of seatbelt usage before pregnancy. The dependent variable is the practice of seatbelt usage among pregnant front passengers during pregnancy.

### Statistical analysis

All analyses were carried out via SPSS version 27, with a confidence level of 95% and a standard error of 5%, and the significance level was set at a p-value of 0.05. The factors associated with the practice of seatbelts during pregnancy were analysed using logistic regression analysis. After initial selection using simple logistic regression with a criterion of  $p \leq 0.25$ , the eligible variables were analysed using multiple logistic regression (MLR) to identify the dominant variable(s) [19]. The MLR was done using the Enter or Forced Entry method, in which all independent variables were entered into the model simultaneously without selection based on statistical significance [20]. A p-value < 0.05 is used as a statistical significance criterion [21]. Further, a multicollinearity analysis is carried out using the Tolerance and Variance Inflation Factor (VIF). If tolerance > 0.2, then multicollinearity is not a serious problem, while if VIF < 5, then multicollinearity

is low, not a problem; if  $5 \leq \text{VIF} < 10$ , then multicollinearity is moderate and needs to be watched out for, and if  $\text{VIF} \geq 10$ , then multicollinearity is high, and the regression model can experience serious problems [22]. In this study, the Hosmer-Lemeshow Goodness-of-Fit Test was used to assess the suitability of the regression model to the data. The model is considered fit if the p-value > 0.05 [23].

### Ethical approval

Ethical approval was received from the Health Research Ethics Committee of the Health Polytechnic of East Kalimantan, Indonesia (LB.01.01/7.1/005630/2021).

### Results

A total of 326 pregnant women participated in this study. The demographic characteristics of the participants are shown in Table 1.

Pregnant women had good and poor knowledge, in 192 (58.9%) and 134 (41.1%) women, respectively. Furthermore, 135 (41.7%) and 190 (58.3%) had positive and negative attitudes, respectively. One of the questions in the knowledge domain of the SaPeIH-Q was to identify the correct placement of the three-point seatbelt; in which only 128 (39.3%) pregnant women were able to identify this correctly. Further, only 123 (37.7%) pregnant women knew that there was a law indicating that seatbelt wearing was compulsory.

### The practice of seatbelt usage among pregnant front passengers ( $n=326$ )

Among the 326 pregnant front passengers, more than half (174 (53.4%)) always used seatbelts, whereas 152 (46.6%) never used seatbelts before they became pregnant. During pregnancy, only 73 (22.4%) always used seatbelts, whereas 253 (77.6%) never used them. The reasons given for not using seatbelts during pregnancy were short journey time in 144 (56.9%), feeling uncomfortable in 138 (54.5%), being afraid of endangering their fetuses in 44 (17.4%), not wearing seatbelts in 26 (10.3%), making them nauseous in 7 (2.8%), and causing shortness of breath in 3 (1.2%).

### Factors associated with the practice of seatbelt usage among pregnant front passengers during pregnancy

Based on simple logistic regression analysis, nine independent variables (occupation, distance from home to clinic < 1 km, distance from home to clinic > 2 km, gestational age in the first trimester and third semester, history of receiving information on seatbelt usage, practice of seatbelt usage among pregnant front passengers before pregnancy, and knowledge and attitudes toward seatbelt usage) were included in the multiple logistic regression

**Table 1** Demographic characteristics of pregnant front passengers in Samarinda, Indonesia ( $n = 326$ )

Variable		Frequency (%)
Age	1. Late adolescence (17–25 years)	134 (41.0)
	2. Early adulthood (26–35 years)	162 (49.7)
	3. Late adulthood (36–45 years)	30 (9.2)
Ethnic	1. Indigenous tribe	164 (50.3)
	2. Immigrant tribe	162 (49.7)
Occupation	1. Not working	251 (77.0)
	2. Working	75 (23.0)
Distance between home to the clinic	1. < 1 km	66 (20.2)
	2. 1–2 km	109 (33.4)
	3. > 2 km	151 (46.3)
Income	1. Low income ( $\leq$ Rp.4000.000)	144 (44.17)
	2. High income ( $>$ Rp. 4000.000)	182 (55.8)
Education	1. Basic Schooling	271 (83.1)
	2. High Education	55 (16.9)
Number of Pregnancy	1. Primigravida	134 (41.1)
	2. Multigravida	192 (58.9)
Gestation Age	1. Trimester 1	95 (29.1)
	2. Trimester 2	112 (34.4)
	3. Trimester 3	119 (36.5)
History of receiving information about seatbelts usage in pregnancy	1. Yes	76 (23.3)
	2. No	250 (76.7)
Source of information about seatbelt usage (multiple answer option) ( $n = 76$ )	1. Friend and family	3 (0.9)
	2. Health workers	1 (0.3)
	3. Electronic media television	30 (39.5)
	4. Internet	56 (73.7)
	5. Radio	8 (10.5)
	6. Traffic police	31 (40.8)
Preferred source of information (multiple answer)	1. Videos	195 (59.8)
	2. Counselling	1 (0.3)
	3. Audio recording	93 (28.5)
	4. Digital application	133 (40.8)
	5. Social media	100 (30.7)
	6. Internet	160 (49.1)

analysis ( $p$  value  $\leq 0.25$ ). Further details are presented in Table 2.

Based on the results of simple logistic regression analysis, nine variables have a  $p$ -value  $\leq 0.25$ . These nine variables were then analysed using multiple logistic regression via the enter method to see their simultaneous association with the practice of seatbelt use in pregnant front seat passengers. The analysis showed that only two variables were significantly associated with the practice of using seatbelts in pregnant front passengers ( $p < 0.05$ ); which were the practice of using seatbelts before pregnancy and knowledge of seat belt use; as shown in Table 3.

These two variables were further analysed using multiple logistic regression, and the results of the final analysis can be found in Table 4. Two variables (the practice of seatbelt usage among pregnant front passengers before pregnancy and the knowledge of seatbelt usage among pregnant women) were found to be significantly ( $p < 0.05$ ) related to pregnant front passengers' usage of seatbelts in the final multiple logistic regression analysis. Pregnant front passengers who used seatbelts before pregnancy were 2.737 times more likely to practice during pregnancy. Pregnant women who had good knowledge were 2.277 times more likely to practice during pregnancy. The Hosmer-Lemeshow value produces  $p = 0.365$ , more than 0.05, meaning that there is a match between the observed data and the regression model.

The practice of seat belt usage before pregnancy and the knowledge of seatbelt usage among pregnant women, which were significantly associated with the practice of seatbelt usage among pregnant front passengers during pregnancy, showed no multicollinearity as the tolerance value  $> 0.2$  and the variance inflation factor (VIF) value  $< 5$ , namely 0.906 and 1.103, respectively.

## Discussion

Our study revealed that the majority (77.6%) of pregnant front passengers did not use seatbelts while travelling via car transportation during pregnancy. This finding differs from several previous studies that reported a high percentage of seatbelt use among front passengers during pregnancy, ranging from 80.9 to 98% [11, 13]. Some of the factors associated with noncompliance include maternal physical changes, maternal education levels, lack of knowledge, and the acquisition of prior information about seatbelt usage.

We found that the practice of seatbelt usage among pregnant front passengers during pregnancy was significantly associated with knowledge of seatbelt usage; pregnant women who had good knowledge were two times more likely to use seatbelt during pregnancy. The finding is like previous studies, it was shown that by acquiring knowledge about seatbelt usage, one would be more likely to practice [24]. In addition, seatbelt ignorance was the reason for the decrease in adherence to their use [25].

Pregnant women who know the benefits of using a seatbelt during pregnancy tend to use a seatbelt during their pregnancy [11]. Thus, having poor knowledge of seatbelt usage leads to ignorance of the benefits of seatbelt usage. We found that pregnant women who did not wear seatbelts provided many reasons, such as feeling uncomfortable, making them nauseous, and causing shortness of breath. Pregnant women persevere if there are few troubles, such as the above if they know it is for the safety of their unborn child and themselves. Furthermore, poor knowledge may lead pregnant women to believe that

**Table 2** Factors associated with seatbelt usage among pregnant front-age passengers during pregnancy according to simple logistic regression ( $n = 326$ )

Variable	The practice of seatbelt usage among pregnant front passengers during pregnancy					P value
	Coefficient Beta	S.E.	OR	95% CI for OR		
				Lower	Higher	
Age						
Late adolescence (17–25 years)	0.222	0.274	1.249	0.730	2.135	0.417
Early adulthood (26–35 years)	-0.051	0.266	0.950	0.564	1.600	0.847
Late adulthood (36–45 years)	-0.441	0.423	0.644	0.281	1.474	0.297
Ethnicity Categories	0.161	0.266	1.175	0.697	1.979	0.546
Occupation	0.646	0.358	1.909	0.947	3.848	<b>0.071*</b>
Distance from home to clinic						
< 1 km	0.448	0.361	1.566	0.772	3.176	<b>0.214*</b>
1–2 km	0.113	0.285	1.120	0.641	1.956	0.692
> 2 km	-0.367	0.267	0.692	0.411	1.168	<b>0.168*</b>
Income	0.125	0.267	1.133	0.672	1.912	0.639
Education categories (Basic schooling & High education)	0.310	0.378	1.363	0.650	2.859	0.413
The gestational age						
Trimester 1 (0–12 week)	-0.526	0.279	0.591	0.342	1.021	<b>0.060*</b>
Trimester 2 (> 12–28 week)	0.085	0.282	1.089	0.627	1.892	0.763
Trimester 3 (> 20–40 week)	0.432	0.289	1.540	0.874	2.713	<b>0.135*</b>
History of exposure to information on seatbelts usage	0.799	0.369	2.224	1.078	4.585	<b>0.030*</b>
Practice of seatbelt usage before pregnancy	1.236	0.299	3.441	1.914	6.187	<b>&lt;0.001*</b>
The knowledge of seatbelt usage	1.086	0.274	2.961	1.730	5.070	<b>&lt;0.001*</b>
The attitude of seatbelt usage	0.612	0.268	1.845	1.091	3.119	<b>0.022*</b>

\* The variables included in multiple logistic regression analysis ( $p \leq 0.25$ )

**Table 3** Factors association with the practice of seatbelt usage among pregnant front passengers during pregnancy using multiple logistic regression ( $n = 326$ )

Variable	The practice of seatbelt usage among pregnant front passengers during pregnancy					P Value
	B	S.E.	Adj. OR	95% CI for OR		
				Lower	Upper	
Occupation	0.429	0.398	1.536	0.704	3.347	0.281
Distance from home to clinic						
< 1 Km	0.273	0.439	1.314	0.556	3.105	0.533
1–2 Km	-	-	-	-	-	-
> 2 Km	-0.234	0.325	0.792	0.418	1.498	0.473
The gestational age						
Trimester 1 (0–12 week)	-0.458	0.349	0.633	0.319	1.255	0.190
Trimester 2 (> 12–28 week)	-	-	-	-	-	-
Trimester 3 (> 20–40 week)	0.364	0.361	1.439	0.709	2.920	0.314
History of exposure to information on seatbelts usage	0.781	0.410	2.183	0.977	4.876	0.057
Practice of seatbelt usage among front passengers before pregnancy	1.094	0.324	2.987	1.584	5.633	<b>0.001*</b>
The knowledge of seatbelt usage among pregnant women	1.130	0.407	3.096	1.394	6.877	<b>0.006*</b>
The attitude of seatbelt usage among pregnant women	-0.458	0.406	0.633	0.286	1.401	0.259

\*The factors were significantly associated with the practice of seatbelt usage among front passengers during pregnancy ( $p < 0.05$ )

wearing seatbelts during pregnancy may do more harm than good to their unborn babies [24, 25]. Pregnant women have a strong sense of a protective nature toward their unborn fetus; thus, this, not surprisingly, will consequently lead to noncompliance. This was also found in

our study, as some of the women did not wear seatbelts because they were afraid of endangering their fetuses.

In Indonesia, specific locally produced guidelines related to driving safety, including the use of seatbelts for pregnant women, are not available. In countries where this information is available, the knowledge is



**Table 4** Factors associated with seatbelt usage among pregnant front passengers during pregnancy ( $n = 326$ )

Variable	The practice of seatbelt usage among pregnant front passengers during pregnancy					P Value
	B	S.E.	Adj. OR	95% CI for OR		
				Lower	Upper	
Practice of seatbelt usage before pregnancy	1.007	0.311	2.737	1.487	5.038	0.001*
The knowledge of seatbelt usage among pregnant women	0.823	0.287	2.277	1.297	3.997	0.004*

\*These factors were significantly associated with the practice of seatbelt usage among front passengers during pregnancy ( $p < 0.05$ )

Hosmer and Lemeshow Test:  $p = 0.365$  ( $p > 0.005$ )

better, and the compliance rate is higher [15, 16, 24, 26, 27]. In the United States of America, for example, the American College of Obstetricians and Gynaecologists (ACOG), together with the National Highway Traffic Safety Administration (NHTSA) and the American Medical Association, recommended and emphasized the importance of seatbelt use during pregnancy by providing information on how to use seatbelts correctly, thus avoiding discomfort or injury due to the use of seatbelts among pregnant women [28, 29]. In addition, in Indonesia, material concerning the importance of using seatbelts during pregnancy has not been included in the maternal and child health book published by the Ministry of Health of the Republic of Indonesia [30]. This may lead to the perception that the seatbelt issue is not important.

We also found that pregnant women rarely received information regarding seatbelt usage during pregnancy from healthcare professionals but received information elsewhere, namely, internet, radio, friends, and family. The accuracy of the information from these sources cannot guarantee their validity. Therefore, incorrect information may be relayed about seatbelt use during pregnancy, which may pose a great risk to pregnant women, resulting in incorrect usage of the seatbelt and/or non-compliance. Alarming, we found that only 39% of pregnant women could correctly identify the position of the seatbelt when it was used during pregnancy. This may mean that more than half of the women could use seatbelts incorrectly when travelling via car transportation, which increases the risk of harming themselves and their unborn fetuses. Incorrect placement of seatbelts has been found previously to cause complications such as placental abruption, uterine rupture, preterm birth, low birth weight, infant respiratory distress syndrome, maternal shock, polytrauma, and longer hospital stays. In addition, it was found that in those who had premature birth as a result of RTA, there was an increased risk of cerebral palsy [31].

Therefore, pregnant women must receive education about seatbelts during pregnancy during their antenatal period. Previously, increased information on the correct method of wearing seatbelts during pregnancy was reported resulting in an increase in the prevalence of seatbelt usage among pregnant women [32].

Furthermore, providing educational leaflets to pregnant women has led to a marked increase in knowledge and compliance with the use of seatbelts during pregnancy among pregnant women [33]. In addition, verbal information given by healthcare providers can lead to an improvement in the compliance rate [24, 27, 34]. Pregnant women who remember instructions on how to use seat belts correctly were found to be able to answer questions about the accurate placement of a three-point seatbelt [13]. Compared with those who do not receive information, pregnant women who have received information about the use of seatbelts also tend to be able to identify the correct use of seatbelts [27, 34–36]. A demonstration may also be needed to provide information to ensure correct and confident seatbelt use [36]. We found that most pregnant women preferred to have their source of information in the form of a video and via the Internet and social media. A video would allow a demonstration of the correct use of seatbelts without being physically present with the pregnant woman. Social media or the internet can make videos accessible at any time and any location. Hence, there is a need to develop educational modules in the form of videos that are widely accessible via the Internet and social media.

One of the known contributing factors to high rates of seatbelt noncompliance during pregnancy is the unavailability of national legislation, which makes seatbelt use during pregnancy compulsory [10]. In Japan, pregnant women are exempt from mandatory seatbelt laws, leading to a significant decline in seatbelt use as pregnancy progresses [11]. The rate of compliance improved in Japan after the introduction of compulsory belt legislation [37, 38]. Further, countries with available national legislation have achieved higher rates of compliance [13, 25, 36]. The United States mandates seatbelt use for all occupants, including pregnant women, and the degree of compliance with seatbelt usage among pregnant women is approximately 88%, which is comparable to that among nonpregnant women [39]. In Indonesia, however, the obligation to use seatbelts for drivers and front passengers for the general public, including pregnant women in Indonesia, was stipulated in Law No. 22 of 2009 concerning traffic and road transportation [40]. However, this

did not favour the compliance rate of seatbelt use in our study. Why was the compliance rate still poor?

One of the reasons could be the lack of legal awareness among pregnant women, as we found that only 37.7% of pregnant women were aware of the availability of the law, as stipulated earlier. Thus, it is important to increase awareness among pregnant women. Public health campaigns through mass media have been shown to create awareness and encourage positive behavioural change [41]. In addition, enforcement campaigns have been shown to increase awareness of and compliance with legislation [42].

The enforcement of the law is crucial to promote compliance. The law was being enforced in Indonesia as the number of tickets/penalties issued by the police increased [43, 44]. However, infirm legal action or penalties do not provide a deterrent effect for lawbreakers. Legal actions or penalties that are considered light may cause people to ignore the law. In Indonesia, the penalty for not wearing seatbelts is Rp 250,000.00 (USD 15). This amount could otherwise buy a full tank (30 L) of subsidized petrol for a 1500 cc car. In comparison, the penalty for not wearing a seatbelt is up to £500 (Rp 9 million) and up to \$50 (Rp. 813,000.00), in the UK and USA, respectively. Previously, it was reported that an increase in penalty levels is associated with an increase in seatbelt usage [45]. Local policymakers could explore this further and review the penalty to help increase the degree of compliance.

Furthermore, enforcement of the law would require considerable manpower and resources. During peak hours, when most of the roads are congested, the law enforcement officers on duty are found to give out warnings to offenders, as the procedure of giving out penalties would add to the chaos, as there would be a need to stop the vehicle for longer to give out tickets [44]. The introduction of areas with camera enforcement has helped identify traffic offenders; however, this approach is not widely available in Samarinda. In addition, more legal enforcement officers will be required on-site to correct seatbelt placement if the seatbelts are found incorrectly.

In addition to knowledge of seatbelt usage, the practice of seatbelt usage before pregnancy is also associated with the use of seatbelts during pregnancy. Pregnant women are almost three times more likely to wear seatbelts during pregnancy if they use seatbelts before they become pregnant. This finding is like those of previous studies [27, 35]. The habit of using seatbelts was developed because the women were accustomed to using seatbelts before pregnancy, strengthening their commitment to using them during their pregnancy as a protective measure [25, 46]. However, alarmingly, we found that only half of the pregnant women used seatbelts before pregnancy. It seems that seatbelt usage is not a normality among women in Samarinda. Families, husbands, or

friends who always use seatbelts may influence increasing seatbelt use during pregnancy [24]. Therefore, to increase the compliance rate of seatbelt usage among pregnant women, the compliance rate of seatbelt usage among people in Samarinda in general should be improved, especially among women of reproductive age.

There are several limitations to our study. The data were obtained via self-administered questionnaires, and the practice of seatbelt usage was dependent on recall and was largely subjective. Our participants were mainly from clinics, so the results cannot be generalized to all of Indonesia.

#### Acknowledgements

The researchers would like to acknowledge Universiti Teknologi MARA (UiTM), Mr. Mujito Hadi and Mrs. Hj. Sumiati, Chairpersons of the Yayasan Wiyata Husada Samarinda and Prof. Dr. Eka Ananta Sidarta as head of ITKES Wiyata Husada Samarinda for their support.

#### Author contributions

Conception and design, Analysis and interpretation of data (e.g., statistical analysis, biostatistics, computational analysis), writing, review, and/or revision of the manuscript: IH, IAI, ZI, MSRM, and SD. Data collection: IH.

#### Funding

None.

#### Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request. Owing to privacy and ethical restrictions, the data are not publicly available.

#### Declarations

##### Ethics approval and consent to participate

This research was conducted in compliance with the Helsinki Declaration. Ethical approval was received from the Health Research Ethics Committee of the Health Polytechnic of East Kalimantan, Indonesia (LB.01.01/7.1/005630/2021) in line with the principles stated in the Research Ethics Guidelines and Standards and National Health Development (PSEPPKN) that refer to World Health Organisation 2011 (Standards & Operational Guidance for Ethics Review of Health-Related Research with Human Participants) and CIOMS 2016 Standards. (Standards by the Research Ethics Commission and National Health Development). Each participant signed a consent form before admission to the study.

##### Consent for publication

Consent to publish has been received from all participants.

##### Competing interests

Ida Hayati, Suzanna Daud, Zaliha Ismail and Ilham Ameera Ismail had filed for copyright # Sapeih-Q: Kuesioner Penggunaan Sabuk Pengaman Pada Ibu Hamil and certificate of notification CRLY2024M01549 was issued by the Intellectual Property Corporation of Malaysia (MyIPO).

Received: 25 February 2025 / Accepted: 6 May 2025

Published online: 21 May 2025

#### References

1. Petrone P, Jiménez-Morillas P, Axelrad A, Marini CP. Traumatic injuries to the pregnant patient: a critical literature review. *Eur J Trauma Emerg Surg*. 2019;45(3):383–92. <https://doi.org/10.1007/s00068-017-0839-x>.
2. Muraoka J, Otsuka T, Yamauchi A, Terao K. Uterine trauma and intra-uterine fetal death caused by seatbelt injury. *Case Rep Obstet Gynecol*.

- 2019;2019:5262349. <https://doi.org/10.1155/2019/5262349>. Published 2019 Nov 16.
3. Jamroz K. Macro model of seat belt use by car drivers and passengers. *Transp Problems: Int Sci J*. 2013;8:103–14.
  4. Huecker MR, Chapman J. Seat belt injuries. *StatPearls. Treasure Island (FL): StatPearls Publishing* Copyright ©. 2020, *StatPearls Publishing LLC.*; 2020.
  5. Kemenhub RI. Perhubungan Darat Dalam angka 2013. Jakarta: Kementerian Kesehatan Republik Indonesia; 2014.
  6. Wahidin A. Pengaruh penggunaan sabuk keselamatan (safety belt) terhadap tingkat fatalitas kecelakaan dan tingkat keparahan kecelakaan (study kasus kecelakaan Jalan Tol Seksi A, B, C Cabang Semarang). Universitas Diponegoro. 2008.
  7. Hanahara K, Hitosugi M, Tateoka Y. Education for appropriate seatbelt use required for early-phase pregnant women drivers. *Sci Rep*. 2020;10(1):17609. <https://doi.org/10.1038/s41598-020-74730-5>. Published 2020 Oct 19.
  8. Jamjute P, Eedarapalli P, Jain S. Awareness of correct use of a seatbelt among pregnant women and health professionals: a multicentric survey. *J Obstet Gynaecol*. 2005;25(6):550–3. <https://doi.org/10.1080/01443610500231393>.
  9. Werawatakul Y, Chaivoramukkul C. Maternal knowledge, attitude and practice of safety belt use during pregnancy at Srinagarind hospital. *J Med Assoc Thai*. 2004;87(1):59–65.
  10. Daud S, Mohd Zahid A, Abdullah B, Mohamad M. Knowledge and practice of seat belt use among pregnant women. *J South Asian Federation Obstet Gynecol*. 2018;10:297–301.
  11. Ichikawa M, Nakahara S, Okubo T, Wakai S. Car seatbelt use during pregnancy in Japan: determinants and policy implications. *Inj Prev*. 2003;9(2):169. <https://doi.org/10.1136/ip.9.2.169>.
  12. Karbakhsh M, Ershadi Z, Khaji A, Rahimi-Sharraf B. Seat belt use during pregnancy in Iran: attitudes and practices. *Chin J Traumatol*. 2010;13(5):275–8.
  13. Johnson HC, Pring DW. Car seatbelts in pregnancy: the practice and knowledge of pregnant women remain causes for concern. *BJOG*. 2000;107(5):644–7. <https://doi.org/10.1111/j.1471-0528.2000.tb13307.x>.
  14. Carlsson A, Sawaya B, Stigson H. Evaluation of seatbelt use among pregnant women in Sweden. *National Highway Traffic Safety Administration 27th International Technical Conference on the Enhanced Safety of Vehicles*. 2023.
  15. Taylor AJ, McGwin G Jr., Sharp CE, Stone TL, Dyer-Smith J, Bindon MJ, et al. Seatbelt use during pregnancy: a comparison of women in two prenatal care settings. *Matern Child Health J*. 2005;9(2):173–9. <https://doi.org/10.1007/s10995-005-4906-2>.
  16. Collins AC, Miller LE, Seeley A, Telehowski PM, Atkinson TS. Analysis of restraint use in pregnant versus non-pregnant populations involved in motor vehicle collisions. *Am J Surg*. 2020;220(5):1304–7. <https://doi.org/10.1016/j.amsurg.2020.06.065>.
  17. Leong CM, Lee TI, Chien YM, Kuo LN, Kuo YF, Chen HY. Social Media-Delivered patient education to enhance Self-management and attitudes of patients with type 2 diabetes during the COVID-19 pandemic: randomized controlled trial. *J Med Internet Res*. 2022;24(3):e31449. <https://doi.org/10.2196/31449>.
  18. Hayati I, Ismail IA, Daud S, Mohd Rashid MS, Ismail Z. Development and validation of SaPelH-Q: A questionnaire to measure knowledge, attitude, and practice on seat belt usage among pregnant women in Indonesia. *Clin Epidemiol Global Health*. 2025;32. <https://doi.org/10.1016/j.cegh.2025.101944>.
  19. Steyerberg E. Clinical prediction models: A practical approach to development, validation, and updating. 2009;19. <https://doi.org/10.1007/978-0-387-77244-8>.
  20. Menard S. Applied logistic regression analysis. SAGE Publication. 2002. <https://doi.org/10.1002/9781118548387>.
  21. Bursac Z, Gauss CH, Williams DK, Hosmer DW. Purposeful selection of variables in logistic regression. *Source Code Biol Med*. 2008;3:17. <https://doi.org/10.1186/1751-0473-3-17>.
  22. Hair JF, Blac WC, Anderson RE. Multivariate data analysis (8th ed.) *Changage Learning*. 2018:832.
  23. Hosmer DWC, Lemeshow S. Applied logistic regression. Wiley. 2000. <https://doi.org/10.1002/9781118548387>.
  24. McGwin G Jr., Russell SR, Rux RL, Leath CA, Valent F, Rue LW. Knowledge, beliefs, and practices concerning seat belt use during pregnancy. *J Trauma*. 2004;56(3):670–5. <https://doi.org/10.1097/01.ta.0000117014.57431.1d>.
  25. Lam WC, To WW, Ma ES. Seatbelt use by pregnant women: a survey of knowledge and practice in Hong Kong. *Hong Kong Med J*. 2016;22(5):420–7. <https://doi.org/10.12809/hkmj164853>.
  26. Acar BS, Edwards AM, Aldah M. Correct use of three-point seatbelt by pregnant occupants. *Safety*. 2018;4(1):1. <https://doi.org/10.3390/Safety4010001>.
  27. Tyroch AH, Kaups KL, Rohan J, Song S, Beingesser K. Pregnant women and car restraints: beliefs and practices. *J Trauma*. 1999;46(2):241–5.
  28. NHTSA. If you are pregnant; Seat belt recommendation drivers and passengers. In: Transportation Do, editor.: National Highway Traffic Safety Administration (NHTSA). 2015:6. Available from: <https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/pregnant-seat-belt-use.pdf>
  29. NHTSA. Federal motor vehicle safety standards; occupant crash protection in: transportation do, editor.: National Highway Traffic Safety Administration, (NHTSA). 2016:81. Available from: <https://www.govinfo.gov/content/pkg/FR-2016-04-06/pdf/2016-07827.pdf>
  30. Kemenkes RI. Buku kesehatan ibu dan anak. Jakarta: Kementerian Kesehatan Republik Indonesia. 2022.
  31. Redelmeier DA, Naqib F, Thiruchelvam D, Barrett R. Motor vehicle crashes during pregnancy and cerebral palsy during infancy: a longitudinal cohort analysis. *BMJ Open*. 2016;6(9):e011972. <https://doi.org/10.1136/bmjopen-2016-011972>.
  32. Hoshino M, Shinozaki H, Ogawa S, Hayashi K, Itoh M, Iwase A. Exposure to information and seat belt use among pregnant women: A Cross-sectional study in suburban Japan. *Kitakanto Med J*. 2020;70:207–13. <https://doi.org/10.2974/kmj.70.207>.
  33. Morikawa M, Yamada T, Kogo H, Sugawara M, Nishikawa A, Fukushima Y, et al. Effect of an educational leaflet on the frequency of seat belt use and the rate of motor vehicle accidents during pregnancy in Japan in 2018: a prospective, non-randomised control trial with a questionnaire survey. *BMJ Open*. 2019;9(9):e031839. <https://doi.org/10.1136/bmjopen-2019-031839>.
  34. Pearlman MD, Phillips ME. Safety belt use during pregnancy. *Obstet Gynecol*. 1996;88(6):1026–9. [https://doi.org/10.1016/s0029-7844\(96\)00333-x](https://doi.org/10.1016/s0029-7844(96)00333-x).
  35. Schiff MKT, Reiff K, Pathak D. Seat belt use during pregnancy. *West J Med Assoc Thai*. 1992;156:655–7.
  36. Koppel S, Bugeja L, Zou X, McDonald H, Lue K-A, Forman J, et al. Assessing seatbelt use among pregnant drivers in Australia: correct seatbelt positioning, discomfort, knowledge and information sources. *J Saf Res*. 2025;93:15–23. <https://doi.org/10.1016/j.jsr.2025.02.015>.
  37. Nakahara S, Ichikawa M, Wakai S. Seatbelt legislation in Japan: high risk driver mortality and seatbelt use. *Inj Prev*. 2003;9(1):29–32. <https://doi.org/10.1136/ip.9.1.29>.
  38. Nippon.com. Despite law, many in japan fail to belt up in back seat Nippon.com; 2023. Available from: <https://www.nippon.com/en/japan-data/h01596/despite-law-many-in-japan-fail-to-belt-up-in-the-back-seat>
  39. Espelien C, Jin R, Mostofzadeh S, VanRyzin R, Hartka T, Forman J, et al. Seat belt use in the US by pregnant motor vehicle occupants. *JAMA Netw Open*. 2023;6(9):e2334272–e.
  40. Pemerintah Republik Indonesia. Undang-undang (UU) Nomor 22 Tahun 2009 Tentang Lalu Lintas Dan Angkutan Jalan Jakarta. Indonesia, Pemerintah Pusat; 2009.
  41. Wakefield MA, Loken B, Hornik RC. Use of mass media campaigns to change health behaviour. *Lancet*. 2010;376(9748):1261–71. [https://doi.org/10.1016/s140-6736\(10\)60809-4](https://doi.org/10.1016/s140-6736(10)60809-4).
  42. Chekijian SA, Truzyan N. Practices, attitudes and perceptions toward road safety in Yerevan, Republic of Armenia. *Ann Adv Automot Med*. 2012;56:191–200.
  43. Dewabrata W, Rendah, Kesadaran Penggunaan Sabuk Pengaman di Jakarta. *Kompas*. 2019 July 11, 2019. Available from: <https://www.kompas.id/baca/utama/2019/07/11/rendah-kesadaran-memakai-sabuk-pengaman-di-jakarta>
  44. Putra D. Upaya Peningkatan Kesadaran Hukum Pengemudi mobil Dalam Penggunaan safety belt. *Unes J Swara Justisia*. 2018;2(2):160–72.
  45. Nichols JL, Tippetts AS, Fell JC, Eichelberger AH, Haseltine PW. The effects of primary enforcement laws and fine levels on seat belt usage in the united States. *Traffic Inj Prev*. 2014;15(6):640–4. <https://doi.org/10.1080/15389588.2013.857017>.
  46. Abdullahi AS, Yasin YJ, Shah SM, Ahmed LA, Grivna M. Seat belt use among pregnant women in the united Arab Emirates: the Mutaba'ah study. *Inj Prev*. 2024;30(2):108–13.

## Publisher's note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.