



Research Article

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The Characteristics of Pregnant Women Who Use Rear Seats and the Factors Associated with Rear Seat Belt Use in a Suburban Area of Japan

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Abstract

Objective: This study was conducted to identify high-risk pregnant women by examining the characteristics of pregnant women who do not normally use rear seat belts in automobiles during pregnancy among actual rear seat users in a provincial city of Japan.

Methods: We employed a descriptive analysis of cross-sectional survey data collected via self-administered questionnaires at seven obstetric facilities in Maebashi. We analyzed the data of 1,085 pregnant women.

Results: A total of 72.1% (782/1,085) of the women rode in the front passenger seat during pregnancy, and 27.9% (303/1,085) rode in the rear passenger seat. The percentages of nulliparous and parous women who used front passenger seats before and during pregnancy were 69.6% (536/770) and 30.4% (234/770), respectively. The percentages of those who used the rear passenger seats before and during pregnancy were 3.2% (8/248) and 96.8% (240/248), respectively.

The factors associated with rear seat use by parous pregnant women before and during pregnancy were having one child and an educational attainment of a bachelor's degree or above. The factors associated with starting, maintaining, or increasing regular rear seat belt use by parous pregnant women after pregnancy began were having a higher education, having one child, and perceiving that seat belt use during pregnancy is compulsory.

Conclusion: These results suggest that targeting the health education of parous women and encouraging them to wear seat belts during pregnancy may lead to an increase in the number of rear seat belt users in further longitudinal studies.

Keywords

Automobiles; Cross-Sectional studies; Health education; Japan; Perception; Pregnancy; Seat belts

Introduction

A study of the general population in Japan found that the risk of death among rear passengers who did not use seat belts was about

3.8 times that of passengers who used seat belts [1]. Another study found that the risk of death for drivers and front passengers who used seat belts was about five times higher when the rear passenger was unbelted, suggesting that all car occupants should wear seat belts to protect themselves and other passengers [2].

Motor vehicle accidents are the leading cause of traumatic fetal injury among pregnant women [3-5]. Approximately 3% of mothers experience a motor vehicle crash during pregnancy [6]. Pregnant women in motor vehicle accidents have a higher risk of preterm labor, placental abruption, and cesarean delivery, while infants born to women who were injured during pregnancy have higher risks of preterm birth and low birth weight [3,7,8]. Another previous study revealed that unbelted pregnant women were about three times as likely as belted pregnant women to experience fetal death in crashes [5,6]. Previous literature reviews have concluded that pregnant women should use seat belts to protect themselves and their unborn babies [9-11]. Furthermore, Hitosugi et al. has called for refinement of the rear seat belt system in order to improve passenger safety, especially for pregnancy women [12]. In Japan, the revised Road Traffic Act, which requires the use of both front and rear seat belts, was implemented in 2007 and has been enforced since 2008 [13]. Additionally, the Japan Society of Obstetrics and Gynecology and the Japan Association of Obstetricians and Gynecologists have, since 2008, recommended that pregnant women use seat belts [14].

Unfortunately, rear seat belts are still used much less commonly by pregnant women compared to the driver's seat or front passenger seat belts [1,15]. There have been several recent studies on the prevalence of rear seat belt use during pregnancy [16-18]. The latest investigation, which examined different generational populations in 2017, demonstrated that people use rear seat belts less than they do the driver's seat or front passenger seat belts [19]. Concerning seat belt use by pregnant women, specifically, most studies have employed self-reported questionnaire surveys to examine seat belt use before and during pregnancy [15-17,20]. While some of these studies considered which seat position pregnant women used [17,21], they have not elucidated the characteristics of pregnant women who used rear seats. To promote rear seat belt use during pregnancy, and thereby promote the safety of pregnant women and fetuses, it is important to examine pregnant women who normally use rear seats but do not normally use rear seat belts.

Two factors previously found to significantly influence seat belt use during pregnancy were having obtained information on how to correctly wear a seat belt during pregnancy and the perception that seat belt use is compulsory during pregnancy [18,22]. Previous research has shown that pregnant women's knowledge of seatbelt use is generally inadequate [15,23-25]. Countries that enforce laws requiring rear passengers to wear seat belts have been found to have a higher prevalence of such use compared to countries without these laws [26]. Moreover, a comparative study on the enforcement of laws relating to seat belt use showed that countries that enforced laws requiring passengers to wear seat belts had a higher rate of seat belt use after the law had been enforced compared with before [27]. As noted earlier, in Japan, the revised Road Traffic Act—which was proposed in 2007 and enforced since 2008 mandates the use of front and rear seat belts [13]. Comparisons of studies from before and after

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enforcement of the revised Road Traffic Act in Japan show that seat belt use among pregnant women in the driver and front passenger seats increased after the enforcement of the Road Traffic Act, whereas rear seat belt use remained low [13,15,16].

During pregnancy, it is especially important for mothers to use seat belts when riding in either the front or rear seats of cars to protect themselves and their unborn babies. Because past studies rarely focused on the seat position of pregnant women, it remains necessary to identify the characteristics of actual rear seat belt users by examining pregnant women who use rear seats and to promote the safety of pregnant women and fetuses. We previously reported the frequency of rear seat belt use among pregnant women [18]. The current study focused on the characteristics of pregnant women who ride in the rear seat of a vehicle and the related factors of increased rear seat belt use among these passengers. Determining the characteristics of pregnant women who normally ride in the rear seat of a vehicle is not only expected to help increase rear seat belt use among pregnant passengers, but also to contribute to the safety of pregnant women and their fetuses, as well as the safety of front-seated passengers. The purpose of this study was to detect high-risk pregnant women by examining the characteristics of pregnant women who do not normally use rear seat belts in automobiles during pregnancy among all rear seat users in a provincial city of Japan.

Methods

Design

In this cross-sectional survey study, we aimed to determine the characteristics of pregnant women who ride in the rear seats of cars and to reveal factors related to increased rear seat belt use during pregnancy.

Participants

This study's participants were recruited from seven clinics and hospitals. The recruitment process is shown in Figure 1. During the study period (October to December 2013), 1,546 pregnant women were recruited, all of whom were patients visiting the study sites for prenatal checkups. The only inclusion criteria of this study were that participants were pregnant and visiting one of the study institutions during the investigation period. The exclusion criterion was being unable to read Japanese. A total of 1,494 women or approximately 96.6% (1,494/1,546) of all pregnant women who visited the participating institutions during the study period participated in this study. The questionnaire was written entirely in Japanese. As per the exclusion criterion, women who were unable to read Japanese were excluded, leaving a final total of 1,085 participants.

Riding position before and during pregnancy was defined as follows. FF indicates passengers who rode in the front passenger seat before and during pregnancy, RR indicates passengers who rode in the rear passenger seat before and during pregnancy, FR indicates passengers who rode in the front passenger seat before pregnancy but rode in the rear passenger seat during pregnancy, and RF indicates passengers who rode in the rear passenger seat before pregnancy but rode in the front passenger seat during pregnancy.

Ethical considerations

Before conducting the survey, ethical approval for the study design was obtained from the Epidemiologic Research Ethics Committee of Gunma University Faculty of Medicine (No. 25–36). After obtaining

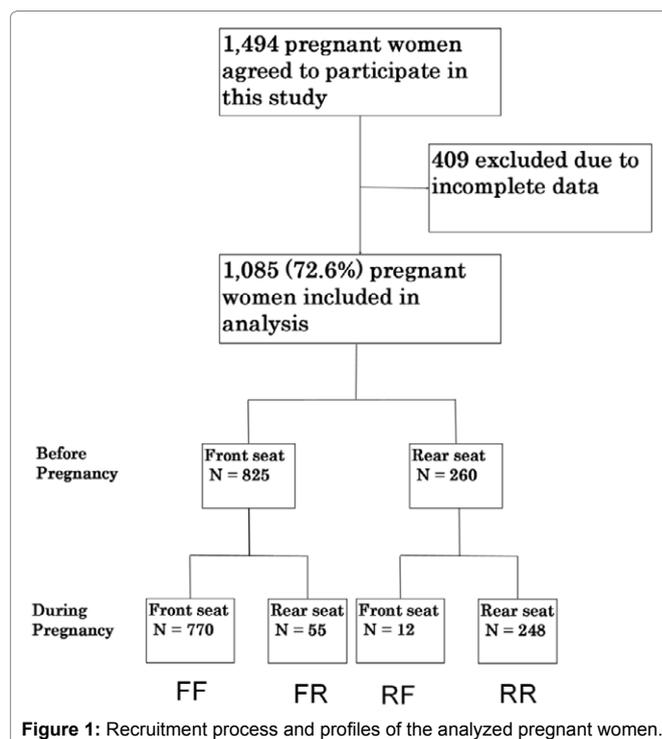
approval from the ethical committee, approval was also obtained from the directors at the seven participating facilities. Moreover, approval for the study was obtained from the Maebashi Medical Association and the Gunma Society of Obstetrics and Gynaecology.

Protection of participants

The questionnaire included a statement acquainting anonymous participants with the study and declaring that submission was equivalent to providing consent to participate in the survey. The questionnaire also contained an additional statement explaining that the study had no relation to the participants' health examinations.

Data collection

The self-administered questionnaires were anonymously given to participants while they were waiting in the reception areas for prenatal consultations with their obstetricians. At that time, they were informed of the study's purpose and procedure. The participants submitted their questionnaires by placing them in collection boxes in the reception areas. The questionnaire took the form of a booklet written in Japanese. The items in the questionnaire asked for information on participants' demographic characteristics such as age; gestational age, which was classified as less than 14 weeks, 14–27 weeks, and ≥ 28 weeks; educational attainment, which was classified as university or above (yes or no); parity; number of children; and possession of a driver's license. For participants' age, gestational age, and number of children, individuals were requested to simply write in the applicable numbers. We also assessed whether participants had acquired information on correct seat belt use during pregnancy, whether rear seat belt use during pregnancy was perceived as compulsory, and whether the participant believes that pregnant women are exempt from seat belt use for health reasons. The participants were asked about their personal seat belt use in the rear seat before and during pregnancy. The response options were as follows: always, often, sometimes, and never. Finally, the participants



were asked about their seating locations as passengers before and during their pregnancies Figure 1.

Data analysis

Descriptive statistics (interquartile ranges and percentages) were used to analyze the participants' demographic characteristics and rear seat belt use. Age and gestational age were analyzed with the Mann-Whitney U test. The chi-square and Fisher's exact test for contingency were used to compare the categorical variables between FF and RR participants. FF and RR participants who were parous were also compared on the basis of these variables. The possible associated factors with seat belt use before and during pregnancy were then tested. These associated factors were selected with reference to previous studies [20, 28-30]. The contribution of each factor to a change in seat belt use after pregnancy was estimated, and the group that reported "positive" seat belt use (continuous always, continuous often, continuous sometimes, or increased) was compared to the group that reported "negative" seat belt use (reduced or continuous never) using logistic regression analysis. A variable was considered for multivariate analysis when its univariate P-value was <0.05. The logistic regression analysis estimated the odds ratios and 95% confidence intervals of the rear seat passengers. SPSS Statistics 24

was used for the statistical computations, and the cutoff for statistical significance was P<0.05.

Results

Sample characteristics

Seventy-six percent (825/1,085) of the participants rode in the front passenger seat before pregnancy, and 24.0% (260/1,085) rode in the rear passenger seat. Moreover, 72.1% (782/1,085) of the participants rode in the front passenger seat during pregnancy, and 27.9% (303/1,085) rode in the rear passenger seat. A total of 71.0% (770) of the participants were FF and 22.9% (248) were RR. However, less than 10% of the participants changed their passenger seat position after pregnancy: only 5.1% (55) of the participants were FR, while 1.1% (12) of the participants were RF. The comparison of the characteristics of the FF and RR participants is shown in Table 1.

The Characteristics of Parous Passengers

Table 2 provides a comparison of the characteristics of the parous passengers. Table 3 shows the perceptions and knowledge of parous pregnant women concerning the use of seat belts. The comparisons of the parous FF and RR participants regarding the number of children

Table 1: Pregnant women's demographic characteristics (FF vs. RR).

Variable	FF (N = 770)	RR (N = 248)	P-value
Age†			
Median (IQR‡)	30 (27–34) years	32.5 (29–36) years	<0.001***
Age (≥30 years) (Yes)§	424 (55.1%)	177 (71.4%)	<0.001***
Parity§			
Nulliparous (parity = 0)	536 (69.6%)	8 (3.2%)	<0.001***
Parous (parity ≥ 1)	234 (30.4%)	240 (96.8%)	
Gestational age†			
Median (IQR‡)	26 (19–34) weeks	26 (18.25–33) weeks	0.513
Gestational age¶			
<14 weeks	96 (12.5%)	38 (15.3%)	0.475
14–27 weeks	309 (40.1%)	103 (41.5%)	
≥28 weeks	365 (47.4%)	107 (43.1%)	
Educational attainment university or above§			
Yes (≥University)	197 (25.6%)	67 (27.0%)	0.677
No (<University)	573 (74.4%)	181 (73.0%)	
Possession of a driver's license§			
Yes	756 (98.2%)	241 (97.2%)	0.314

†: Mann-Whitney U test; ‡: Interquartile range; §: Chi-squared test or Fisher's exact test; ¶: Pearson chi-squared test; *** P < 0.001

Table 2: Parous pregnant women's demographic characteristics

Variable	FF in parous women (N = 234)	RR in parous women (N = 240)	P-value
Age (≥30 years) (Yes) §	154 (65.8%)	172 (71.7%)	0.197
Number of children§			
One (1)	156 (66.7%)	198 (82.5%)	<0.001***
(≥2)	78 (33.3%)	42 (17.5%)	
Gestational age¶			
<14 weeks	28 (12.0%)	38 (15.8%)	0.475
14–27 weeks	101 (43.2%)	100 (41.7%)	
≥28 weeks	105 (44.9%)	102 (42.5%)	
Educational attainment of bachelor's degree or above§			
Yes (≥Bachelor's degree)	44 (18.8%)	66 (27.5%)	0.029*
No (<Bachelor's degree)	190 (81.2%)	174 (72.5%)	

§: Chi-squared test or Fisher's exact test; ¶: Pearson chi-squared test; * P < 0.05, ** P < 0.01, *** P < 0.001

(one child) and educational attainment (high) yielded statistically significant differences ($P < 0.05$).

The Characteristics of Parous Passengers Who Used Rear Seats

Of the rear seat parous passengers, 21.3% and 20.8% reported that they “always” wore a seat belt before and during pregnancy, respectively. Moreover, seat belt use among the remaining rear seat parous passengers was “often” among 23.8% and 26.7% of them before and during pregnancy, respectively; “sometimes” among 30.4% and 25.8%; and “never” among 24.6% and 26.7%. Approximately 20% of the rear seat parous passengers reported that they always used a seat belt before and during pregnancy in each trimester. A Kruskal-Wallis test revealed no significant difference between seat belt use before and during pregnancy.

Factors Associated with Rear Seat Belt Use by RR Parous Passengers

Table 4 shows the factors associated with rear seat belt use during pregnancy among the RR parous passengers. The univariate analysis revealed that having an educational attainment of university or above, having one child, and perceiving rear seat belt use during pregnancy as compulsory were significantly and positively associated with rear seat belt use during pregnancy. In the multivariate analysis, these three factors remained significantly and positively associated with rear seat belt use after pregnancy.

Discussion

This study investigated the characteristics of rear seat passengers during pregnancy, which were not considered in previous relevant studies on seat belt use among pregnant women [15-17]. The findings indicated that such passengers were mostly parous pregnant women. More specifically, approximately one-half of parous women rode in the front seat, and about 50% rode in the rear seat. Two characteristics—that is, the proportion of participants with one child and a high education level—differed significantly between parous participants who rode in the rear seat and those who rode in the front seat. Altogether, the results clarify the characteristics of pregnant women who should be encouraged to use the rear seat belt during pregnancy.

This study showed that 27.9% of pregnant women rode in the rear passenger seat. In contrast, a previous study conducted between 2013

and 2014 reported that only 23.8% of pregnant women rode in the rear passenger seat [17]. In this study, 20.8% of rear-seat passengers always wore a seat belt during pregnancy, while a previous study in 2012 reported that the prevalence of rear seat belt use during pregnancy was only 17% [16]. Moreover, a study of Maebashi’s population in 2013 revealed that the prevalence of seat belt use among non-pregnant women (49.7%) was similar to that among rear seat parous passengers in our study before pregnancy (45.1% when combining always + often responses) [31]. This shows that our results were similar to those of previous studies conducted in Japan, suggesting our study findings are reliable.

The main influencing factor for an increase or maintenance of rear seat belt use after pregnancy among parous participants was their perception that rear seat belt use during pregnancy was compulsory. Previous studies of the general population have reported that rear seat belt use in states that enforce the relevant laws on seat belt use was higher than in states without such laws [26,32]. Other previous studies reported that pregnant women’s seat belt use was significantly higher among those who had obtained knowledge of compulsory seat belt use during pregnancy than among those who were unaware of compulsory seat belt use during pregnancy [18,22]. Thus, an effective way of boosting rear seat belt use during pregnancy might be to advise parous pregnant women that they must wear seat belts while they are riding in a rear passenger seat, as well as when they are riding in the front.

Another important influencing factor of rear seat belt use among parous participants was having a high education level. This finding is similar to that of a previous study that surveyed the general population [30], and suggests that education may be one effective means of improving the rear seat belt use during pregnancy. Educational attainment is one of several factors that might explain the lower overall prevalence of seat belt use. Interestingly, however, knowledge differences might not explain the observed differences by education level, given that there were no differences in responses for the many of the knowledge items between the high and low education groups. Specifically, in each group, approximately 80% responded to the “perception that rear seat belt use is compulsory during pregnancy,” approximately 60% responded to the “knowledge of exemption from the obligation to wear seat belts during pregnancy,” and approximately 35% responded to “receiving information on how to wear a seat belt correctly during pregnancy.”

Table 3: Perception and knowledge of seat belt use among parous pregnant women (FF vs RR).

Variable	FF in parous women (N = 234)	RR in parous women (N = 240)	P-value
Knowledge of exemption from the obligation to wear a seat belt during pregnancy§ (Yes)¶	129 (55.1%)	144 (60.0%)	0.307
Acquired information on how to wear a seat belt correctly during pregnancy (Yes)¶	88 (37.6%)	86 (35.8%)	0.704
Perception that rear seat belt use is compulsory during pregnancy (Yes)¶	203 (86.8%)	201 (83.8%)	0.368

§: Knowledge that if pregnant women are not wearing a seat belt during pregnancy because of doctor’s orders, it is because they are exempted from this obligation; ¶: Chi-squared test or Fisher’s exact test; * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$

Table 4: Factors associated with rear seat belt use by RR parous pregnant women according to a logistic regression analysis of rear seat passengers (“Positive” vs. “Negative”; Adjusted odds)

Factor	P-value	Odds ratio	95% confidence interval
Educational attainment was university or above (Yes/No)	0.044	1.073	1.002–1.149
Number of children (One/More than one)	<0.001	1.135	1.057–1.218
The perception that rear seat belt use is compulsory during pregnancy (Yes/No)	0.002	3.284	1.574–6.852

Finally, “having one child” was found to influence the increase or maintenance of rear seat belt use after pregnancy by parous participants. However, this study did not investigate which seat position the children of the pregnant women rode in. Future studies should ask pregnant women where their children ride when they ride together in a vehicle.

These findings which were the characteristics of pregnant women who use rear seat and the characteristics of pregnant women of rear seat belt use provide us useful strategy to increase rear seat belt use of pregnant women.

This study had several limitations. First, the use of a cross-sectional survey may raise concerns about recall bias. However, we believe that the likelihood of recall bias is small in this study because the participants would not have received or missed out on any benefits by answering the questions about seating position or seat belt use. Presently, the Traffic Road Act has no associated penalty for violating traffic rules concerning non-use of rear seat belts on general roads, even though the Traffic Road Act makes rear seat belt use compulsory in Japan. No matter how participants responded, there would be no benefit or lack thereof for the participants. Moreover, Steptoe et al. reported that seat belt usage was one of the most stable health-related behaviors [33]. Furthermore, we asked whether participants wore rear seat belts before and during pregnancy. As all participants were currently pregnant, it was likely easy for the participants to recall the relevant actions they were taking both at present and several months prior.

Second, this study might not present a generalized picture of pregnant women’s characteristics throughout Japan because the sample was from one suburban city, and almost all the participants had driver’s licenses. The characteristics of women without driver’s licenses might differ from those of women with driver’s licenses [18]. Thus, the study’s results might be limited to this one provincial city.

Third, this investigation used self-reported questionnaires because it was not feasible to observe actual seat belt practices. However, data based on visual observations of seat belt use might be challenged in various ways, such as the difficulty in distinguishing between pregnant and non-pregnant women inside cars and in distinguishing between seat belt straps and other types of shoulder/lap straps. It would be particularly difficult to distinguish between non-pregnant women and women in the early weeks of pregnancy. Therefore, self-reported data seems to be the most reasonable approach for evaluating pregnant women’s seat belt use, despite its limitations. Therefore, we think that self-reported questionnaires are an appropriate way of obtaining these data.

Finally, this study found that the factor that was most frequently associated with starting, maintaining, or increasing regular use of rear seat belts by parous passengers after the beginning of pregnancy was a perception that rear seat belt use during pregnancy was compulsory; however, this study could not identify the influencing factors using a cross-sectional approach. Further longitudinal studies should account for the influencing variables and factors. Moreover, this study was unable to provide an understanding of the ways in which that information was obtained. Future studies should focus on learning more about women’s informational sources for seat belt use during pregnancy.

Conclusion

In conclusion, this study found that about one-half the parous pregnant women in the sample rode in the rear seats of cars, and

they tended to have one child and high educational attainment. This study also found that the compulsory perception might be the factor associated to increase rear seat belt use. The findings suggest that the provision of legal information about seat belt use during pregnancy to parous pregnant women might be effective for increasing their rear seat belt use. Overall, this study might help in developing programs that facilitate rear seat belt use during pregnancy.

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