ORIGINAL ARTICLE

Car seatbelt use during pregnancy in Japan: determinants and policy implications

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Context: Pregnant women are exempted from the current seatbelt legislation in Japan despite the fact that seatbelt use is essential to reduce the risk of fatalities for these women and their fetuses in car crashes.

Objective: To examine factors that might influence seatbelt use during pregnancy.

Methods: A cross sectional study, with data collected via an anonymous, self administered questionnaire at obstetric clinics in suburban areas of Japan. Altogether 880 pregnant women receiving pre-natal care in July 2001 were recruited. The relative effects of factors that might influence seatbelt use during pregnancy were estimated using logistic regression analysis.

Results: Almost 70%–80% of pregnant women were consistent seatbelt wearers before pregnancy but seatbelt compliance was reduced by about half at 20 weeks or more gestation. Only 20% had received information on maternal seatbelt use, with one third reporting that seatbelt use is beneficial during pregnancy. Those who perceived that maternal seatbelt use is beneficial tended to maintain use, but daily car users and those who knew that they were exempted from seatbelt legislation were more likely to reduce use.

Conclusions: Knowledge of the legislative exemption for pregnant women, misunderstanding of the benefits, and daily car use contributed to the reduction in seatbelt use after pregnancy.

Maternal deaths as a result of traumatic injuries are becoming more prominent owing to the reduction of maternal mortality from other causes. Among external causes of these deaths, car crashes dominate.^{1–4} They are also a leading cause of fetal deaths associated with maternal trauma.⁵

Seatbelt use is recommended for pregnant women because it reduces fatal risks for the women and their fetuses in car crashes.^{6–8} Studies outside of Japan suggest that seatbelt compliance increases during pregnancy.^{9–10} Reasons for not wearing seatbelts include discomfort, fear of harming the fetus, forgetfulness, or habitual non-use. Non-seatbelt wearers were less likely to have received information on maternal seatbelt use and tended to misunderstand its benefits.^{9–11–12}

Seatbelt use during pregnancy has gone unnoticed in Japan because expectant mothers are exempted from seatbelt legislated requirements.¹³ This policy is in contrast to many other industrialized countries. Alongside other factors known to be

associated with low seatbelt compliance—for example, age (younger), education (lower), socioeconomic status (lower), seating location (passengers), and annual distance traveled (longer)—there is likely to be reduced use during pregnancy.^{14–19} The relative effects of factors affecting seatbelt use at this time need to be estimated when planning effective seatbelt promotion aimed at expectant mothers.

In this study we investigated seatbelt use among pregnant women as drivers and front seat passengers and estimated the effects of factors that might influence seatbelt use during pregnancy.

METHODS

The study site was Mito City, the capital of Ibaraki Prefecture and situated about 100 km northeast of Tokyo. There were 247 566 residents with 2652 newborns in 1999 (population density 1407/km²). In Mito cars are a common means of transport, though public transportation is also available.

Table 1 Reported seatbelt use before pregnancy and current use among 880 pregnant women in Japan, shown by gestation period*†; results are number (%)

Location/seatbelt use	<20 weeks		20–29 weeks		30 weeks +	
	Before	Current	Before	Current	Before	Current
Driver's seat						
Always	172 (82.3)	129 (62.3)	211 (83.4)	127 (51.4)	229 (78.4)	108 (37.9)
Often	14 (6.7)	22 (10.6)	17 (6.7)	30 (12.1)	31 (10.6)	32 (11.2)
Sometimes	19 (9.1)	34 (16.4)	22 (8.7)	42 (17.0)	29 (9.9)	58 (20.4)
Never	4 (1.9)	22 (10.6)	3 (1.2)	48 (19.4)	3 (1.0)	87 (30.5)
Front passenger's seat						
Always	164 (76.3)	118 (55.1)	190 (72.0)	108 (41.4)	208 (67.3)	89 (29.2)
Often	19 (8.8)	35 (16.4)	24 (9.1)	36 (13.8)	45 (14.6)	26 (8.5)
Sometimes	25 (11.6)	33 (15.4)	41 (15.5)	57 (21.8)	42 (13.6)	81 (26.6)
Never	7 (3.3)	28 (13.1)	9 (3.4)	60 (23.0)	14 (4.5)	109 (35.7)

*Total number (in driver's seat) is not equal to the number of pregnant women (with driver's license) due to missing data.

†Seatbelt use before pregnancy was not significantly different across gestation periods, whereas the difference in current use was significant across gestation periods.

Table 2 Number and proportion of pregnant women who reduced seatbelt use after pregnancy, shown by gestation period; results are number (%)

Location	<20 weeks	20–29 weeks	30 weeks +
Driver's seat	53 (25.7)	104 (42.1)	158 (55.6)
Front passenger's seat	58 (27.4)	118 (45.2)	179 (58.9)

Mito has 14 obstetric clinics and four hospitals with obstetricians. Of these facilities, three are located in the west, four in the south, five in the east, and six in the central division of the city. The charge for prenatal care is standardized at 6150 yen (approximately US\$50). The local government subsidizes prenatal care at any facility they attend. Medical costs associated with the delivery are also almost completely subsidized under the health insurance scheme that covers the entire population.

We invited all the obstetric clinics and hospitals in the study site to participate. Two hospitals and seven clinics agreed, two hospitals and six clinics declined, and one clinic had no clients during the study period. Of the nine collaborating facilities, at least two covered each division of the city. At these facilities, all pregnant women who received prenatal care in July 2001 were invited to participate in the study. Those unable to read Japanese and emergency cases were excluded.

A self administered questionnaire with an explanation of the aim of the study was given to pregnant women at the facilities' reception. They were asked to complete it by themselves while waiting for their consultation with the obstetrician. Duplicate responses were avoided as we focused on those who received prenatal care and gave a questionnaire only once before a consultation. Of the 893 pregnant women invited, 880 responded (response rate 98.5%).

The average age of respondents was 28.9 years (SD 4.6) with a mean gestation period of 25.5 weeks (SD 9.0). Altogether 436 (50.5%) were primigravida, 842 (95.7%) had a driver's license, 319 (40.9%) reported daily car use, and 582 (73.7%) occupied the front seat more frequently than the rear.

We asked about seatbelt use before pregnancy and about current use (always, often, sometimes, never) of the driver's seat or front passenger's seat. We examined changes in seatbelt use by gestation period (less than 20 weeks, 20–29 weeks, 30 weeks or above). We also asked about knowledge of the legislative exemption for pregnant women and perception and information acquisition regarding seatbelt use during pregnancy.

As potential determinants for seatbelt use during pregnancy, we considered age, gestation period, gravidity, daily car use, knowledge of the legislative exemption, perception, and information acquisition.^{9 11 12 14–20} Although education and socioeconomic status are known to influence seatbelt use, these questions are deemed sensitive in Japan. To obtain cooperation from the facilities for data collection, we had to refrain from requesting such personal information from the respondents.

We estimated the contribution of these factors to changes in seatbelt use after pregnancy (reduced seatbelt use compared with maintained or increased seatbelt use) using logistic regression analysis, and estimated crude and adjusted odds ratio and 95% confidence intervals for drivers and front passengers seats separately.

To obtain informed consent, we explained the aim of the study and requested voluntary participation. No information that would have identified the respondents was requested. Moreover, data were independently compiled by the collaborating clinics and hospitals thus guaranteeing anonymity.

RESULTS

Table 1 shows self reported seatbelt use before pregnancy and current use of drivers and front seat passengers by gestation period. Before pregnancy, 80.0% of drivers and 69.4% always used seatbelts. There was no significant difference in seatbelt use before pregnancy across gestation periods. Conversely, current seatbelt use was significantly different across gestation periods. Consistent ("always") driver seatbelt users were found among 62.3% at less than 20 weeks' gestation but was significantly lower at 20–29 weeks (51.4%) and 30 weeks or more (37.9%). Correspondingly, the no ("never") seatbelt use rate increased. A similar trend was found for front passenger use across gestation periods. When using the rear seat, however, a majority never used seatbelts before pregnancy (74.9%) or during pregnancy (80.9%) (data not shown).

Table 2 shows the proportion whose current seatbelt use was lower than before the pregnancy. Seatbelt use was reduced at all periods of gestation, but the reduction became larger as gestation increased. For both drivers and front passengers, about half of the pregnant women at gestation period of 20 weeks or above stated that their seatbelt use at present was less frequent than before pregnancy.

Those who reduced seatbelt use after pregnancy reported that discomfort and fear of adverse effects on the fetus deterred them from use. They also relied on the legislative exemption.

Six hundred and twenty five (74.0%) knew that seatbelt use was not compulsory during pregnancy but 295 (33.6%)

Table 3 Effects of factors influencing changes in seatbelt use after pregnancy, shown by seating location

Factors	Driver's seat				Front passenger's seat			
	Crude OR	95% CI	Adjusted OR	95% CI	Crude OR	95% CI	Adjusted OR	95% CI
Age	1.00	0.97 to 1.03	1.01	0.97 to 1.05	1.00	0.97 to 1.03	1.00	0.96 to 1.04
Gestation period (referent: <20 weeks)								
20–29 weeks	0.48	0.32 to 0.71	0.46	0.30 to 0.73	0.46	0.31 to 0.67	0.44	0.28 to 0.68
30 weeks +	0.28	0.19 to 0.41	0.23	0.14 to 0.35	0.26	0.18 to 0.38	0.23	0.15 to 0.35
Primigravida (yes/no)	1.27	0.96 to 1.68	1.32	0.92 to 1.89	1.28	0.97 to 1.68	1.38	0.97 to 1.94
Daily car use (yes/no)	0.76	0.57 to 1.00	0.62	0.44 to 0.88	0.56	0.34 to 0.94	0.48	0.25 to 0.89
Seatbelt use is not compulsory during pregnancy (yes/no)	0.42	0.30 to 0.60	0.45	0.30 to 0.68	0.37	0.26 to 0.51	0.41	0.27 to 0.61
Seatbelt use is beneficial during pregnancy (yes/no)	4.57	3.27 to 6.40	4.31	2.94 to 6.31	3.88	2.83 to 5.32	3.67	2.56 to 5.26
Ever obtained information on seatbelt use during pregnancy (yes/no)	1.11	0.78 to 1.58	0.82	0.54 to 1.25	1.03	0.73 to 1.46	0.83	0.55 to 1.25

CI, confidence interval; OR, odds ratio.

reported that use is beneficial during pregnancy. A total of 172 (20.0%) had received information on seatbelt use during pregnancy and 203 (23.4%) had received information on child seat use. Maternity and car magazines, newspapers, and friends were cited as information sources. However, no respondent mentioned obstetricians or any other healthcare personnel.

Table 3 shows the relative effects of factors influencing changes in seatbelt use by seating position. Pregnant women reduced their seatbelt use as the gestation period increased, but age and gravidity were not significantly associated with the reduced use as was being a daily car user. Those who knew that seatbelt use during pregnancy was not compulsory were also more likely to reduce their seatbelt use, whereas those who reported it to be beneficial were more likely to maintain or increase use. Information acquisition on seatbelt use during pregnancy did not significantly increase or maintain seatbelt use after pregnancy. The effects of these factors were similar for both seat positions. Multivariate analyses revealed independent associations of these factors except for age, gravidity, and information acquisition.

DISCUSSION

This study identified low seatbelt compliance among pregnant women throughout the gestation period in a suburban area of Japan. Compared with seatbelt use before pregnancy, seatbelt use during pregnancy was reduced for both drivers and front seat passengers. This trend is contrary to the finding in California that seatbelt compliance significantly increased during pregnancy (79% before pregnancy *v* 86% during pregnancy).¹⁰ A study in New Mexico where seatbelt use was generally low also found use increased from 27% to 42% during.⁹

Respondents who declined to use seatbelts mainly claimed discomfort and their fear of harming the fetus. These concerns have also been found among pregnant women who rarely or never used seatbelts.^{11–12} If concerns associated with the gestation period dissuade maternal seatbelt use, then gestation period would be a major determinant for non-restraint use during pregnancy as we found. However, a recent study in the United States reported that trimester status has relatively little effect on seatbelt use.²⁰ This implies that gestation related factors cannot reasonably explain the different trend in maternal seatbelt use between Japan and other industrialized countries. It is unrealistic to assume that pregnant Japanese women were more likely to have such complaints and not wear seatbelts than their foreign counterparts.

It is interesting to note that seatbelt use was consistently higher among drivers than front seat passengers despite discomfort of the steering wheel. Since front seat passengers are less likely to wear seatbelts than drivers among the general population (88.1% for drivers *v* 75.2% for front seat passengers),²¹ it is possible that the same trend would be seen in pregnant women. However, if discomfort is the main reason for reduced seatbelt use, then the reduction after pregnancy should have been greater for drivers.

Discrepancies in seatbelt compliance during pregnancy between Japan and other industrialized countries could be due to differences in laws requiring seatbelt use, and public awareness of it. A large majority of the respondents in studies in the United Kingdom and the United States, where pregnant women are encouraged to continue wearing seatbelts, reported that seatbelt use is beneficial for both pregnant women and their fetuses.^{10–12} In contrast, only one third of our respondents acknowledged this. To promote maternal seatbelt use and help increase awareness of its importance, it is essential that the exemption be withdrawn. Seatbelt use was less among pregnant women who knew of the current exemption.

In our respondents, the importance of seatbelt use during pregnancy was not well recognized. This may partly be attrib-

Key points

- Seatbelt compliance among pregnant Japanese women was reduced compared with their seatbelt use before pregnancy, and was consistently lower throughout the gestation period for both drivers and front passengers.
- Discrepancies in seatbelt compliance during pregnancy between Japan and other industrialized countries could be due to differences in laws requiring seatbelt use and public awareness of it.
- The importance of wearing a seatbelt during pregnancy was not well recognized; only one in five had acquired information on this topic.
- Daily car users were less likely to wear seatbelts despite their longer exposure to the risk of traffic injuries.
- To promote maternal seatbelt use, expectant mothers should not be exempted from seatbelt legislation, and education on traffic safety may prove useful.

utable to the fact that only one in five had acquired information on this topic, mainly from magazines. None reported that their obstetricians had given this information perhaps because Japanese obstetrics textbooks do not address this issue.^{22–23}

Prenatal care offers a good educational opportunity and obstetricians should be encouraged to advise that seatbelt use continue throughout pregnancy. Indeed, in other industrialized countries, obstetricians take an important role in disseminating maternal seatbelt use information and pregnant women who reported receiving this information were more likely to wear seatbelts and do so correctly.^{11–12}

Daily car users were less likely to wear seatbelts despite their longer exposure to the risk of traffic injuries. This suggests that frequent car use may lower risk perception.^{14–17}

This study had a high response rate among those at the collaborating facilities, but half of the clinics and hospitals we invited did not participate. However, collaborating facilities covered most of the city, so any geographic bias should have been mitigated. If, however, pregnant women at the non-participating facilities differed regarding sociodemographic characteristics such as income or education that might be related to seatbelt use this could bias the results. Such differences between facilities may not be relevant because prenatal care is equally subsidized at all facilities, thus income would not restrict respondents to particular prenatal clinics.

As we could not obtain sociodemographic information we cannot determine how similar our participants are to the general population of women of childbearing age. Moreover, if a substantial number of women refused to attend prenatal clinics, we would have missed this subgroup of expectant mothers whose seatbelt compliance could be low. If this were the case, seatbelt use might have been overestimated in this study.

Reporting bias could also have occurred because actual practices were not observed. Previous studies found discrepancies between observed and self reported seatbelt use,^{24–25} although a recent study suggests better agreement between observations and self reports.²⁶ Reporting bias should be more evident among those with low seatbelt use²⁷ but in this study this would have little effect because seatbelt use rate was relatively high. Moreover, the observed rate of seatbelt wearers among the general population in Mito is close to self report levels (“always” and “often”) before pregnancy among our respondents (89.7% *v* 88.7% for drivers, 79.7% *v* 80.9% for front seat passengers).²¹ Finally, the anonymous questionnaire should have minimized this bias. Because we examined changes in seatbelt use after pregnancy, over-reporting should not have greatly biased our analyses.²⁶

We did not examine whether pregnant women wear seatbelts correctly,^{7–8} and it is likely that incorrect use is similar to that reported elsewhere.^{10–12} This is alarming because

incorrect seatbelt use could cause adverse effects on pregnant women and their fetuses in the event of a car crash.^{6 29 30}

POLICY IMPLICATIONS

Pregnant women place themselves and their fetuses at risk of fatal injuries by not wearing seatbelts.^{31 32} To promote maternal seatbelt use, expectant mothers should not be exempted from seatbelt legislation. Education on traffic safety for pregnant women, where they can learn the benefits of proper seatbelt use and the importance of infant restraint devices, may prove useful. Medical professionals should be more involved in educating future mothers on this topic.

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