
SEATBELT POSITIONING DURING PREGNANCY

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ABSTRACT

The objective of this study is to investigate correct seat belt use rates in pregnancy. A structured questionnaire study was centred at the antenatal clinic in Luton and Dunstable Hospital NHS Trust together with Loughborough University in the UK. In addition further responses received via the Internet. Questionnaire responses from the UK were from pregnant women into their 6 to 40+ of pregnancy. Through the website further responses were also received from North America. The women were asked about their use of seat belts and specifically how the shoulder and lap portions of the 3-point seatbelt were positioned. Women were also asked about their experiences about using airbags and head restraints whilst pregnant.

The responses about seatbelt use in pregnancy were analysed and the main safety concerns are found to be low levels of correct seatbelt positioning. Seatbelt use in pregnancy is high in the UK, however less than 13% of the seatbelt users had correctly positioned both portions of the belt. The rate of seatbelt and correct seat belt use in the North American countries is lower than UK.

The research will be extended and a world-wide study will be conducted through collaboration with researchers and motor manufacturers globally to investigate the needs and requirements of pregnant occupants as passengers and drivers.

INTRODUCTION

A report from the Office for National Statistics [1] states that UK women make an average 613 trips per year by car, which is similar to men. According to [2], women in the UK travels 4,573 miles a year on average. Women of childbearing age travel by car more often than men, and during pregnancy women have different travel patterns and preferences due to alterations to their physical form and emotions.

Pregnancy causes wide ranging changes in size and shape that are not limited to the abdomen. The hips and breasts also enlarge greatly in size [3].

Investigation into the safety of using the seat belt in pregnancy has established that the seat belt should be used in pregnancy [4], and that a three-point belt is preferable to a lap only belt [5], [6]. Use of the seat belt in the correct position is also important to minimize the risk of injury to the fetus. The correct positioning has been adopted by current guidelines by the UK Department for Transport [7] and the National Highway Traffic Safety Administration in the USA [8], stating that *'the lap strap should go across the hips, fitting comfortably under the bump, while the diagonal strap should be placed between the breasts and around the bump'* as demonstrated in Figure 1.

In the UK alone there are 750,000 pregnancies each year [9]. The "Automotive Design: Incorporating the Needs of Pregnant Women" project has addressed issues such as seatbelt safety, travel patterns, behaviours, needs and preferences in a holistic manner for the first time and provides explicit information about pregnant women. The project provides a comprehensive analysis of lap and shoulder belt positioning used by pregnant women, as the correct placement of the lap and shoulder sections simultaneously could help the seat belt to function as intended. During this project have been collected data from women around the world; however this paper focuses on the needs of the UK-based pregnant women only.

METHOD

Pregnant respondents answered a 'Pregnancy and Driving Questionnaire' in an interview or by self-completion. The questionnaire was also available for online completion. This Questionnaire can be found at <http://pregnantdriver.lboro.ac.uk> in five languages (English, Spanish, Italian, Turkish and French). 243 sets of questionnaire responses from the UK had been processed and reported in this article. Respondents were reminded repeatedly to compare their pre-pregnancy experiences with their experiences during pregnancy. Questions about all aspects of car travel both as drivers and as passengers were included in the questionnaire. The questions regarding seatbelts were particularly

designed to understand the level of 'correct usage' of these systems. The average gestation levels of the pregnant women recruited to this study was 29.5 weeks. The majority of these women normally occupy the driver's seat, and occasionally use the front or rear passenger seats, and in a few cases the normal occupant position is unknown. Throughout this paper the data analysis refers only to this sample of UK based pregnant women.



Figure 1. A pregnant woman demonstrating the correct wear of the 3-point seatbelt

RESULTS

Using the Seatbelt & Correct Positioning

It is a legal requirement in the UK to wear seatbelts both as drivers and passengers [10]. Pregnant women are not exempt to this rule [7]. Only 6 of the 286 did not wear their seatbelt that is 98% of the UK pregnant women in this sample used their seat belt during car travels. Among those, 243 of the women completed the Questionnaire fully to provide us with detailed description of the way they wear their seatbelts (Table 1). Table 1 also shows the percentages for the shoulder and lap section wearing style combinations. In the Table red numbers show the incorrect and the blue numbers represent the correct positions defined by the Department for Transport [7] for the two sections of the 3-point seatbelt. The correct wear of the seatbelt during pregnancy is wearing the shoulder section of the seatbelt, between the breasts and around the abdomen, and the lap section across the hips underneath the abdomen (simultaneously).

The data reveals that slightly more than half of the pregnant women position the shoulder section of the seatbelt correctly and only about quarter of the sample position the lap section correctly (Table 1).

These rates however include incorrect usage of the complementary section of the 3-point seatbelt.

The seatbelts are designed to protect the car occupants when they are used 'correctly' not necessarily 'correctly in part'. When the entire seat belt positioning is considered only 31 of 243 (12.7%) of UK pregnant women simultaneously positioned both the shoulder and lap sections correctly. That means, approximately only one in eight pregnant women is properly protected by the restraint systems during travel.

This rate might seem low in comparison with previously published studies. This apparent disagreement is due to a lack of clear definition of correct seatbelt positioning in previous researchers' surveys hence clustering the correct and incorrect lap belt positions in one group. Similar mistakes were made for the shoulder belt positions in previous studies.

Many authors described the correct lap belt position as underneath the abdomen, but this does not clearly distinguish between placing the lap belt across the upper thighs (incorrect) and the correct position across the hips according to guidelines [11] of American College of Obstetrics and Gynaecology. Previous papers [12][13][14][15] report a high incidence of correct positioning such as approximately 79%, 69%, 78%, 40-66% respectively. If we combine these two categories as the previous authors did, our data similarly gives 54% (131 of 243) for correct lap portion positioning.

The papers by [12] and [16] state the shoulder belt should pass 'between the breasts' with no mention of how the shoulder belt should be placed on the shoulder. Both of these papers also give a limited range of positions for the shoulder belt. The options in these papers are: behind the back or not used, under the arm, and between the breasts.

This could mean that women who place the belt in any position across their trunk (but not under the arm) are forced to select 'between the breasts' because it is the only available option. Their correct seat belt positioning ratios of 91% and 53-68% could therefore include incorrect positions where the shoulder belt lays off the shoulder, as well as the correct position between the breasts. If we combine these two categories as the previous authors did, our data similarly gives 64% (155 of 243) for correct shoulder portion positioning. The examples could be extended further.

This shows that the surveys could be misleading if the 'correct wear' of the seatbelt is not defined properly.

Table 1. Shoulder and lap belt combinations rates of usage and percentages for UK based pregnant women

	Shoulder Belt				
	Above both breasts	Across one breast & across abdomen	Between breasts & around abdomen	Off shoulder & around abdomen	Total
Lap Belt					
Across upper thighs	10 4.1%	14 5.8%	35 14.4%	9 3.7%	68 28.0%
Across hips underneath abdomen	10 4.1%	18 7.4%	31 12.8%	4 1.6%	63 25.9%
Across abdomen	16 6.6%	20 8.2%	62 25.5%	14 5.8%	112 46.1%
Total	36 14.8%	52 21.4%	128 52.7%	27 11.1%	243 100%

Summary of Table 1

Correct entire belt positioning: 31 of 243 pregnant women (12.8%)

Correct shoulder belt positioning: 128 of 243 seatbelt users (52.7%)

Most common incorrect shoulder belt position:

Across one breast & across abdomen: 52 of 243 seatbelt users (21.4%)

Correct lap belt positioning: 63 of 243 seatbelt users (25.9%)

Most common incorrect lap belt positions:

Across abdomen: 112 of 243 seatbelt users (46.1%)

Flat across upper thighs: 68 of 243 seatbelt users (28.0%)

Further Issues Concerning Seat Belt Positioning

The problems of using seat belts in pregnancy and educating pregnant women for positioning the belt correctly were documented in a related study [16]. A number of further factors such as gestation, number of previous pregnancies, passenger/driver seat position, income and education levels are investigated for whether they influence how pregnant women are positioning their seat belt. The

correct positioning rates for each of these factors are summarised below in Table 2.

The rates of correct seat belt positioning seemed to improve with the progression of pregnancy. The second and third trimesters were focused since most significant physical changes occur during these periods and the sample in the first trimester women was very small. The correct positioning rate is 13% in the second trimester, and 19% in the third trimester. Some women also reported that as

pregnancy progresses the enlarged abdomen holds the lap belt down more securely across the hips. A trend is also revealed that women with more experience of pregnancy seem to be positioning the seat belt correctly more often. 15% of the women in their first pregnancy had the seat belt correctly positioned, but this increased to 17% in the women with 1-3 previous pregnancies and 18% for four or more previous pregnancies.

The majority of the women in our sample were drivers. There was a marked difference in the correct seat belt positioning according to the

occupant position. 19% of drivers had their seat belt correctly positioned, whereas the correct positioning figures were only 3% for the front passengers. Both of rear passengers in our survey positioned their seat belts incorrectly a conclusion cannot be reached as the sample was far too small.

None of the women who had compulsory education only were positioning the seat belt correctly, but it should be noted that it was only a small sample of 5 women. The Further education group and Higher Education group represented a higher rate with 18% and 16% of correct positioning respectively.

Table 2. Variables influencing correct seat belt positioning during pregnancy.

Variable	Group	Number of pregnant women in group	Correct seat belt positioning rate
Trimester	First trimester	12	0%
	Second trimester	98	13%
	Third trimester	176	19%
Experience of pregnancy	First pregnancy	123	15%
	1-3 previous pregnancies	136	17%
	4 or more pregnancies	17	18%
Car seat normally occupied	Driver's seat	237	19%
	Front passenger seat	37	3%
	Rear passenger seat	2	0%
Education level	Compulsory education	5	0%
	Secondary/Further education	89	18%
	Higher education	181	16%

Attitudes Toward Belt Use

Respondents commonly expressed concern that the seat belt was incorrectly positioned, and 25% of the sample said they did not feel safe whilst using the seat belt. In some cases, women ceased using the seat belt due to the fear that the seat belt might harm the fetus in a collision, or due to discomfort. This also shows the importance of comfort whilst using the seat belt, since it can influence whether or not the women are using the seat belt.

A common problem was that the lap portion of the seat belt tended to ride up onto the abdomen during car travel, even after it was placed correctly across the hips at the start of the journey. Many women took action to prevent the lap belt from contacting the pregnant abdomen in order to protect the fetus or to make themselves more comfortable. Some chose to use a lap belt-positioning device to hold the seat belt in the correct position across their hips. None of these women had checked the

validity of additional devices with their insurers. The other method that women used was to hold the belt away from the bump with their hands or thumbs. Similarly, women were also holding the

CONCLUSIONS AND DISCUSSION

Most pregnant women experience a wide range of problems with driving, with using passive safety systems. The main safety concerns are with the low levels of correct seat belt and head restraint positioning. Analysis of 286 questionnaires showed that 98% of the pregnant women in the UK use their seat belt during pregnancy. It is worth noting that this group voluntarily found us and completed the questionnaire, suggesting high motivation. On the other hand, this has added an extra value to our findings: the current guidelines for correct seat belt positioning were followed by less than 13% of the pregnant women in the UK who were proactively seeking information about safe driving during pregnancy.

Both lap and shoulder portions of the belt must simultaneously be positioned correctly otherwise the seat belt may be prevented from operating as intended. Car occupant position and experience of previous pregnancies could influence the correct seat belt positioning.

Accommodating women's altered size and shape and other pregnancy-related changes and symptoms is a 'safety' rather than simply 'comfort' issue since *discomfort* can cause women to take unsafe actions such as not wearing the seat belt or modifying its usage. Improving safety for pregnant car travellers requires a combined approach of increasing awareness of correct positioning and better designs to meet the needs of the pregnant occupant.

"Automotive Design: Incorporating the Needs of Pregnant Women" project provides explicit information about pregnant women. Improving the safety for pregnant car travellers is important. The research will be extended and a world-wide study will be conducted through collaboration with researchers and motor manufacturers globally to investigate the needs and requirements of pregnant occupants as passengers and drivers.

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belt away from their neck because it was cutting in and rubbing them. The women were not aware that holding the belt away could create slack in the belt and may increase the risk of injury.

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