Fetal outcome in motor-vehicle crashes: effects of crash characteristics and maternal restraint

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FROM ABSTRACT

Objective
This project was undertaken to improve understanding of factors associated with adverse fetal outcomes of pregnant occupants involved in motor-vehicle crashes.

Study Design
In-depth investigations of crashes involving 57 pregnant occupants were performed. Maternal and fetal injuries, restraint information, measures of external and internal vehicle damage, and details about the crash circumstances were collected. Crash severity was calculated using vehicle crush measurements.

Results
Fetal outcome is most strongly associated with crash severity and maternal injury.

Proper maternal belt-restraint use (with or without airbag deployment) is associated with acceptable fetal outcome.

Approximately half of fetal losses in motor-vehicle crashes could be prevented if all pregnant women properly wore seat belts.

Conclusion
Higher crash severity, more severe maternal injury, and lack of proper seat belt use are associated with a higher risk of adverse fetal outcome.

These results strongly support recommendations that pregnant women use properly positioned seatbelts.

THESE AUTHORS ALSO NOTE:

Both death and adverse fetal outcomes other than death can occur as a result of trauma sustained in utero.

If a fetus survives a crash, complications resulting from the crash including emergency delivery of a premature fetus, low birth weight and neonatal respiratory distress syndrome or fetal asphyxia, can lead to long-term physical or neurologic problems for the child.
"Abruptio placentae (AP) is the leading cause of fetal loss in motor-vehicle crashes."

"The purpose of this study was to conduct in-depth investigations of motor-vehicle crashes involving pregnant occupants, with a focus on determining how restraint conditions and specific crash characteristics affect fetal outcome."

Studies have shown that pregnant women are more likely to properly wear seat belts when instructed to by their caregivers.

These authors considered an estimated change in velocity or equivalent barrier speed greater than 48 km/h [30 m/h] to be severe because more than 95% of all crashes are greater than this.

These authors considered an estimated change in velocity or equivalent barrier speed between 24 km/h [15 m/h] to 48 km/h [30 m/h] to be moderate severity.

These authors considered an estimated change in velocity or equivalent barrier speed less than 24 km/h [15 m/h] to be of minor severity.

<table>
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<th>Percentage of Adverse Fetal Outcomes</th>
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In this study, “fetal outcome is significantly associated with crash severity, such that minor crashes are more likely to result in acceptable fetal outcomes, whereas severe crashes are more likely to produce adverse fetal outcomes."

“There are no significant relationships between fetal outcome and impact direction."

There are no significant relationships between fetal outcome and the position of the pregnant occupant in the vehicle.

“Fetal outcome is strongly associated with the severity of maternal injury."

At any given crash severity, “the risk of adverse fetal outcome for improperly restrained pregnant occupants is higher than that for properly restrained pregnant occupants. For example, at a crash severity of 30 km/h [18 m/h], the risk of adverse fetal outcome is about 12% for properly restrained pregnant occupants and about 70% for improperly restrained pregnant occupants."
This study shows that “an 84% reduction in risk of adverse fetal outcome is obtained by properly wearing a seatbelt.”

“Unbelted pregnant occupants sustain an estimated 62% of all fetal losses in motor-vehicle crashes. Considering the annual estimate of 369 fetal losses, increasing the belt use rate of pregnant occupants from 80% to 100% would prevent approximately 192 fetal losses.”

“This study suggests that restraint use protects the fetus by protecting the mother, because maternal injury is predictive of fetal outcome, and proper restraint use reduces maternal injury severity.”

This study suggests that “restraint by an airbag plus a 3-point belt leads to fetal outcomes that are as good as restraint only by a 3-point belt. The important point of this finding is that airbags do not appear to worsen fetal outcomes.”

“The risk of adverse fetal outcome for properly restrained pregnant occupants is less than 10% in minor crashes and more than 60% in severe crashes.”

“The main reason for recommending that pregnant occupants use three-point belts is that protecting the mother is the first step to protecting the fetus, and that using seat belts significantly reduces injury risk for the general vehicle-occupant population.”

“The practice of recommending that pregnant patients be instructed to properly use 3-point belts has been questioned by some practitioners because the medical literature contains isolated cases of fetal injuries allegedly caused by seat belt loading in crashes.”

“This study shows that proper use of a belt restraint by the pregnant occupant has a significant, positive effect on fetal outcome. Seventy-nine percent of the pregnant women who were properly wearing a 3-point belt, with or without airbag deployment, had acceptable fetal and maternal outcomes in lower severity crashes. An estimated 192 fetal losses could be prevented each year if all pregnant women properly wore seatbelts. The strong association between maternal injury and fetal outcome, particularly for the 4 cases of maternal death to unrestrained or improperly restrained women, supports previous observations that protecting the mother is the first step in protecting the fetus.”

“The results of this study support the current recommendation that pregnant women should properly wear 3-point belts.”
KEY POINTS FROM DAN MURPHY

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1) Both death and adverse fetal outcomes other than death can occur as a result of trauma sustained in utero.

2) “Abruptio placentae is the leading cause of fetal loss in motor-vehicle crashes.”

3) Studies have shown that pregnant women are more likely to properly wear seat belts when instructed to by their caregivers.

4) These authors considered an estimated change in velocity or equivalent barrier speed:
   A) Greater than 48 km/h [30 m/h] to be severe.
   B) Between 24 km/h [15 m/h] to 48 km/h [30 m/h] to be moderate severity.
   C) Below 24 km/h [15 m/h] to be of minor severity.

5) In this study, “fetal outcome is significantly associated with crash severity, such that minor crashes are more likely to result in acceptable fetal outcomes, whereas severe crashes are more likely to produce adverse fetal outcomes.”

6) There are no significant relationships between fetal outcome and direction of impact direction.

7) There are no significant relationships between fetal outcome and the position of the pregnant occupant in the vehicle.

8) “Fetal outcome is strongly associated with the severity of maternal injury.”

9) At any given crash severity, “the risk of adverse fetal outcome for improperly restrained pregnant occupants is higher than that for properly restrained pregnant occupants. For example, at a crash severity of 30 km/h [18 m/h], the risk of adverse fetal outcome is about 12% for properly restrained pregnant occupants and about 70% for improperly restrained pregnant occupants.”

10) This study shows that “an 84% reduction in risk of adverse fetal outcome is obtained by properly wearing a seatbelt.”
11) “Unbelted pregnant occupants sustain an estimated 62% of all fetal losses in motor-vehicle crashes. Considering the annual estimate of 369 fetal losses, increasing the belt use rate of pregnant occupants from 80% to 100% would prevent approximately 192 fetal losses.”

12) “This study suggests that restraint use protects the fetus by protecting the mother, because maternal injury is predictive of fetal outcome, and proper restraint use reduces maternal injury severity.”

13) Airbag use and deployment “do not appear to worsen fetal outcomes.”

14) “The risk of adverse fetal outcome for properly restrained pregnant occupants is less than 10% in minor crashes and more than 60% in severe crashes.”

15) “The main reason for recommending that pregnant occupants use three-point belts is that protecting the mother is the first step to protecting the fetus, and that using seat belts significantly reduces injury risk for the general vehicle-occupant population.”

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