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# Population knowledge and commitment regarding a child's car safety seat after implementation of the new traffic regulations in Saudi Arabia: a cross-sectional study

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## Abstract

**Objective** This study aimed to evaluate the understanding and adherence to child car safety seat (CSS) guidelines among the general population in the Makkah region of Saudi Arabia following the implementation of new traffic regulations.

**Method** A four-section questionnaire addressing knowledge and attitudes regarding CSSs was distributed among the general population of Makkah city in light of new traffic regulations. Data were collected from 487 respondents, and the chi-square test was utilized for statistical analysis.

**Results** A total of 144 (29.6%) respondents reported using seat belts before the implementation of new regulations, while 101 (20.7%) started using them afterward. Only 31 (6.4%) stated that they would not use them. A total of 318 (65.3%) reported that their behavior towards using child car safety seats abroad will not change. Additionally, 452 (92.8%) believed that government financial support for car seat costs would increase usage and compliance. The knowledge level among those using CSSs (40.3%) was significantly higher than among those who do not (11.3%) ( $p = .001$ ).

**Conclusions** Most of the respondents believed that governmental financial support for CSS costs will lead to increased compliance. Furthermore, there is a direct correlation between knowledge levels and compliance. Therefore, further investment should be focused on raising awareness and enforcing strict regulations.

**Keywords** Knowledge, Commitment, CSS, Implementation, Traffic, Saudi

## Background

Motor vehicle collisions (MVCs) are a global health problem and a major cause of mortality and morbidity among children worldwide [1–4]. In 2020, a report from the Kingdom of Saudi Arabia's (KSA) Ministry of Health (MOH) demonstrated that among a total of 3202 traffic-related injuries sustained by individuals under the age of 18, there were 587 fatalities. This number is nearly equal to the morbidity and mortality of individuals over the age of 51 (3202 and 646, respectively) [4]. In addition, the

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Ministry of Health statistics declared that one-fifth of those killed in traffic accidents are children under the age of 15 [4]. Furthermore, traffic accidents account for 10% of all child deaths in Saudi Arabia.

One of the major factors influencing the outcome of an MVC is the child's position during the accident. Using children's car seats will significantly reduce morbidity and mortality during accidents [4–6]. It was found that the use of restraint car safety seats (CSSs) is a crucial measure to protect children traveling in vehicles [4–7]. In addition, utilizing an additional booster seat was recommended for children younger than 12 years old, as it can reduce the risk of injury by 71–82% compared to using a seat belt alone [5, 8, 9].

The National Highway Traffic Safety Administration (NHTSA) suggests different types of CSS based on a child's age, weight, and height [5, 6]. The rear seat offers protection from airbag deployments, which are associated with a 31% decrease in fatal injuries for restrained children and an 84% reduction for unrestrained child passengers [8, 10].

A study conducted in the city of Taif in KSA indicated a prevalence of 47.3% CSS usage among participants, with 75.5% of them responded that CSSs are always important [1]. Another study carried out in the city of Unaizah revealed a prevalence of 56.7% of seat belt usage among participants [2]. The two most common reasons for not using a CSS were child refusal and a lack of knowledge about its importance [2]. It has also been reported that small families are 2.2 times more likely to use a CSS [3].

At the same time, a study done in Jeddah city in 2022 found that 62.5% of studied mothers stated that their cars were not equipped with a child restraint system (CRS), and that they used ineffective car-sitting methods. This inadequate practice was associated with a number of misconceptions and negative attitudes towards CRS's utility [11].

There is limited data in the literature from KSA concerning the knowledge and commitment of the population regarding CSSs. Therefore, this research aimed to assess the population knowledge and commitment regarding child's car safety seat (after) implementation of the new traffic regulations in Saudi Arabia.

## Methods

### Study design, setting, and time frame

It is a descriptive cross-sectional study conducted in Makkah, Saudi Arabia, in February to March 2023.

### Study participants

The inclusion criteria were parents who have at least one child under 12 years of age, residents of Makkah city for the last 5 years, and individuals who can read and write

**Table 1** Personal characteristics of study participants in Makkah region, Saudi Arabia

Personal data	No	%
<b>Age in years</b>		
18–20	29	6.0%
21–30	172	35.3%
31–40	202	41.5%
> 40	84	17.2%
<b>Gender</b>		
Male	192	39.4%
Female	295	60.6%
<b>Nationality</b>		
Saudi	432	88.7%
Non-Saudi	55	11.3%
<b>Educational level</b>		
High school/below	50	10.3%
Bachelor/diplome	352	72.3%
Post-graduate	85	17.5%
<b>Monthly income</b>		
< 5000 SR	69	14.2%
5000–10,000 SR	156	32.0%
11,000–20,000 SR	196	40.2%
> 20,000 SR	66	13.6%
<b>Children less than 3 years</b>		
No children	154	31.6%
1 child	198	40.7%
2 children	75	15.4%
3 children	29	6.0%
> 3 children	31	6.4%
<b>Children aged 4–7 years</b>		
No children	162	33.3%
1 child	151	31.0%
2 children	112	23.0%
3 children	38	7.8%
> 3 children	24	4.9%
<b>Children aged 8–12 years</b>		
No children	218	44.8%
1 child	105	21.6%
2 children	79	16.2%
3 children	42	8.6%
> 3 children	43	8.8%

Arabic and English. Those who declined to participate or were ineligible were excluded from the study.

### Sample size

The sample size for this study was calculated to be 385 participants using OpenEpi version 3.0.1 considering the population size (according to the 2023 World Population Review) [12–14] of Makkah region. The total population

was estimated at 2,149,928 at a 95% CI and a 5% margin of error. More responses were included until we reached 546 participants to make the study more meaningful. However, a total of 59 responses were excluded for unmatched inclusion criteria (refusal to participate, not meet the inclusion criteria). The remaining 487 responses were included in the analysis.

### Data collection

A pre-designed questionnaire is designed and created using Google Docs (workspace features: survey template). Data were collected in a face-to-face setting for the questionnaire to be completed later. The questionnaire consisted of the following sections: consent form, sociodemographic data, knowledge, and attitude regarding CSSs. Participants were categorized as having a poor knowledge level if their score was less than 60% of the overall score and a good knowledge level if their score was 60% or more of the overall score.

### Data analysis

The Statistical Package for Social Sciences (SPSS) version 21 was used for data analysis. All statistical methods employed were two-tailed, with an alpha level set at 0.05. The overall knowledge level regarding CSS use was assessed by summing up discrete scores for different correct knowledge items. To test the relationship between variables, qualitative data was expressed as numbers and percentages, and the chi-squared test ( $\chi^2$ ) was used.

Multivariate logistic regression analysis was done using the forward likelihood ratio for factors found significant in the univariate analysis. The odds ratio was calculated with a 95% confidence interval, and a  $p$ -value of less than 0.05 was considered statistically significant.

### Results

The study included 487 participants who met the inclusion criteria and completed the questionnaire. The mean age of participants was  $36.1 \pm 12.8$  years old, and the majority of the respondents were females (295, 60.6%) and of Saudi nationality (432, 88.7%).

In terms of education level, 352 (72.3%) had a bachelor's degree or diploma; 196 (40.2%) earned 11,000–20,000 SR monthly; and 68.4% had at least one child aged under 3 years (Table 1).

Table 2 shows that 108 (22.2%) participants knew about the 300–500 Saudi Riyals penalty for children under 10 years sitting in the front seat or not using CSSs, while 252 (51.7%) were aware of it but unsure of the amount. Additionally, 113 (23.2%) knew about the 150–300 Saudi Riyals fine for children not using seat belts, while 216 (44.4%) were aware of it but uncertain of the amount.

A total of 144 (29.6%) participants already used seat belts before the penalties were implemented, 101 (20.7%) started using them since the implementation, and 31 (6.4%) stated they would never use them. More than half, 318 (65.3%), reported that they will maintain

**Table 2** Population commitment regarding a child's car safety seat after implementation of new traffic regulations in Saudi Arabia

Commitment	No	%
<b>Did you know that there has been an irregularity of about 300–500 Saudi Riyal for children less than 10 years and sitting in the front seat/not using child car seats in Saudi Arabia?</b>		
Yes, I know, and I knew how much it is	108	22.2%
Yes, I know, but I didn't know how much	252	51.7%
No, I don't know	127	26.1%
<b>Do you know that there has been an irregularity of about 150–300 Saudi Riyal if a child is not using the seat belt in Saudi Arabia?</b>		
Yes, I know, and I knew how much it is	113	23.2%
Yes, I know, but I didn't know how much	216	44.4%
No, I don't know	158	32.4%
<b>After knowing that Saudi Arabia has been activating irregularities towards children less than 10 years old who are sitting in the front seat/not using child car seats or belts, are you going to use child car safety seats?</b>		
I already used before the irregularities were activated	144	29.6%
I have used it since the irregularities have been activated	101	20.7%
I will use it	211	43.3%
I will not use it	31	6.4%
<b>Are you going to have the same behavior towards using child car safety seats if you go outside Saudi Arabia?</b>		
Yes	318	65.3%
No	169	34.7%
<b>In your opinion, will governmental financial support towards car seat price increase usage and compliance with child car seats?</b>		
Yes	452	92.8%
No	35	7.2%

**Table 3** Population knowledge about child's car safety seats after implementation of the new traffic regulations in Saudi Arabia

Knowledge items		No	%
Do you think car safety is important for child safety in the car?	Always	334	68.6%
	Sometimes	120	24.6%
	Not important	15	3.1%
	I don't know	18	3.7%
Do you think car safety seats are protective if accidents happen?	Always	290	59.5%
	Sometimes	148	30.4%
	Not important	24	4.9%
	I don't know	25	5.1%
Up what age should children use car safety seats?	1 year	30	6.2%
	3 years	61	12.5%
	5 years	68	14.0%
	7 years	52	10.7%
	12 years	21	4.3%
	Until the seat belt fits properly	114	23.4%
	I don't know	141	29.0%
How do you think children aged 1–3 years old should sit in the car?	Rear facing child seat	226	46.4%
	Forward facing child seat	155	31.8%
	Passenger's lap	11	2.3%
	I don't know	95	19.5%
How do you think children aged 4–7 years old should sit in the car?	Front seat with seat belt	31	6.4%
	Back seat with car seat belt	249	51.1%
	Belt positioning booster seat	96	19.7%
	I don't know	111	22.8%
How do you think children aged 8–12 years old should sit in the car?	Front seat with seat belt	52	10.7%
	Back seat with car seat belt	253	52.0%
	Belt positioning booster seat	72	14.8%
	I don't know	110	22.6%
Where do you think is the safest place to keep the child safety seat in the car?	Back seat in the side	291	59.8%
	In the front seat	21	4.3%
	In the middle of seat	66	13.6%
	I don't know	109	22.4%
Do you know that there are different types of car safety seat depending on the child's age?	Yes	383	78.6%
	No	104	21.4%

the same behavior towards using CSSs when driving outside Saudi Arabia. Moreover, the majority, 452 (92.8%), believed that governmental financial support towards CSS costs will increase usage and compliance.

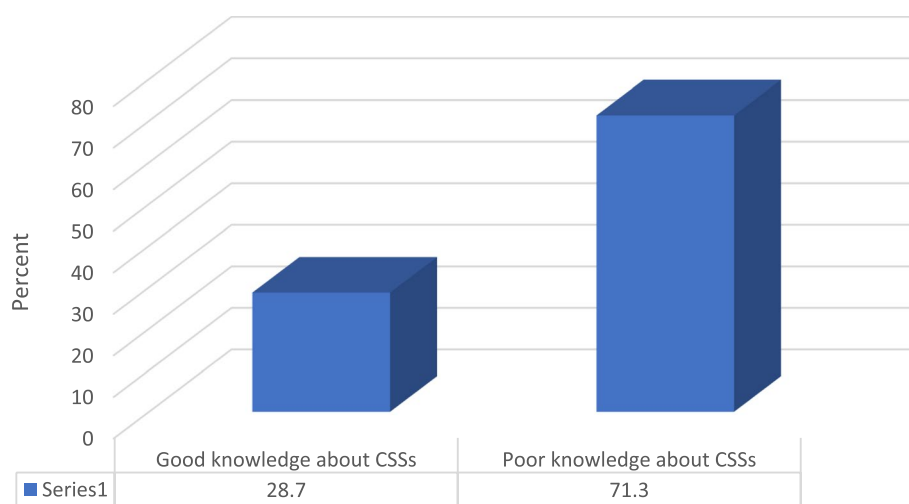
A total of 68.6% of the study participants recognized the importance of car safety for children, and 59.5% acknowledged that CSSs consistently provide protection in the event of accidents. Only 4.3% knew that children should use a CSS until they are 12 years.

Regarding seat positioning, 46.4% were aware that children aged 1–3 years should use rear-facing child seats, 6.4% knew that children aged 4–7 years should use forward-facing seats, while 19.7% understood that belt-positioning booster seats are suitable for children

in the same age range. Regarding seat placement, 59.8% of participants believed that the CSS should be placed in the back seat on the side. Additionally, 78.6% were aware that there are different types of CSSs depending on a child's age (Table 3).

Figure 1 illustrates that only 140 (28.7%) participants had a good knowledge level regarding CSSs, while 347 (71.3%) demonstrated a poor knowledge level.

Table 4 shows that 293 (60.2%) of the participants reported using CSS. Among them, 129 (44%) always used the seats, 46 (15.7%) occasionally used them, and 26 (8.9%) rarely used them. When asked about the age at which they stopped using CSSs, 46 (15.7%) reported stopping at the age of 12 years. Reasons for not using



**Fig. 1** Overall public knowledge level regarding child's car safety seats in Makkah region, Saudi Arabia

CSSs included the seat taking up too much space in the car (24.2%), being expensive (19.1%), a lack of information about the seat (13.9%), believing there is no strict law regarding CSS use (9.3%), and feeling it is not important (4.6%).

Table 5 demonstrates that participants aged 31–40 years, females, those having postgraduate education, with the highest monthly income (> 20,000 SR),

those having 2 children less than 3 years, or having no child aged 8–12 years had a significant higher percent of those who had a good knowledge level ( $p < 0.05$ ). The good knowledge level was also significantly higher among participants who were aware and knew that there has been an irregularity of about 300–500 Saudi Riyal for children under 10 years and sitting in the front seat/not using child car seats in Saudi Arabia

**Table 4** Practice and attitude towards car safety seats among participants in Makkah, Saudi Arabia

Practice and attitude	No	%
<b>Do you use a child car safety seat?</b>		
Yes	293	60.2%
No	194	39.8%
<b>How often do you use a child car safety seat? (n = 293)</b>		
Usually	28	9.6%
Always	129	44.0%
Sometimes	46	15.7%
Rarely	26	8.9%
Prefer not to answer	64	21.8%
<b>At what age does a child stop using a car safety seat? (n = 293)</b>		
1 year	5	1.7%
3 years	21	7.2%
5 years	48	16.4%
12 years	46	15.7%
Prefer not to answer	173	59.0%
<b>What is the reason for not using a child car safety seat? (n = 194)</b>		
Prefer not to answer	56	28.9%
Child car seats take up too much space in the car	47	24.2%
Child car seats are too expensive	37	19.1%
Lack of information	27	13.9%
No strict laws about using child car safety seats	18	9.3%
I don't feel that car safety seats are important	9	4.6%

**Table 5** Factors associated with public knowledge regarding child car seats in Makkah, Saudi Arabia

Factors		Knowledge level				p-value
		Poor		Good		
		No	%	No	%	
Age in years	18–20	27	93.1%	2	6.9%	.007*
	21–30	118	68.6%	54	31.4%	
	31–40	135	66.8%	67	33.2%	
	> 40	67	79.8%	17	20.2%	
Gender	Male	152	79.2%	40	20.8%	.002*
	Female	195	66.1%	100	33.9%	
Nationality	Saudi	306	70.8%	126	29.2%	0.567
	Non-Saudi	41	74.5%	14	25.5%	
Educational level	Secondary/below	46	92.0%	4	8.0%	.001*
	Bachelor/diplome	247	70.2%	105	29.8%	
	Post-graduate	54	63.5%	31	36.5%	
Monthly income	< 5000 SR	55	79.7%	14	20.3%	.017*
	5000–10,000 SR	118	75.6%	38	24.4%	
	11,000–20,000 SR	136	69.4%	60	30.6%	
	> 20,000 SR	38	57.6%	28	42.4%	
Children less than 3 years	No children	101	65.6%	53	34.4%	.003*\$
	1 child	140	70.7%	58	29.3%	
	2 children	51	68.0%	24	32.0%	
	3 children	28	96.6%	1	3.4%	
	> 3 children	27	87.1%	4	12.9%	
Children aged 4–7 years	No children	113	69.8%	49	30.2%	0.294\$
	1 child	102	67.5%	49	32.5%	
	2 children	81	72.3%	31	27.7%	
	3 children	31	81.6%	7	18.4%	
	> 3 children	20	83.3%	4	16.7%	
Children aged 8–12 years	No children	130	59.6%	88	40.4%	.001*
	1 child	79	75.2%	26	24.8%	
	2 children	65	82.3%	14	17.7%	
	3 children	36	85.7%	6	14.3%	
	> 3 children	37	86.0%	6	14.0%	
Did you know that there has been an irregularity of about 300–500 Saudi Riyal for children under 10 years and sitting in the front seat/not using child car seats in Saudi Arabia?	Yes, I know, and I knew how much it is	65	60.2%	43	39.8%	.001*
	Yes, I know, but I didn't know how much	172	68.3%	80	31.7%	
	No, I don't know	110	86.6%	17	13.4%	
Do you know that there has been an irregularity of about 150–300 Saudi Riyal if a child is not using the seat belt in Saudi Arabia?	Yes, I know, and I knew how much it is	74	65.5%	39	34.5%	.001*
	Yes, I know, but I didn't know how much	143	66.2%	73	33.8%	
	No, I don't know	130	82.3%	28	17.7%	
Do you use a child car safety seat?	Yes	175	59.7%	118	40.3%	.001*
	No	172	88.7%	22	11.3%	

P Pearson  $\chi^2$  test. \$Exact probability test. \* $P < 0.05$  (significant)

( $p = < 0.05$ ). Good knowledge was also significantly higher among participants who knew that there has been an irregularity of about 150–300 Saudi Riyal if a child is not using the seat belt in Saudi Arabia and who were using a child car safety seat ( $p = < 0.05$ ).

Multivariate logistic regression analysis was done to assess the independent predictors of good knowledge among studied participants. It was found that having an age ranging from 31 to 40 years, having a postgraduate education, being aware about that there has been an irregularity of about 300–500 Saudi Riyal for children under 10 years and sitting in the front seat/not using child car seats in Saudi Arabia, having knowledge that there has been an irregularity of about 150–300 Saudi Riyal if a child is not using the seat belt in Saudi Arabia, and using a child car safety seat were independent predictors of good knowledge among studied participants ( $p = < 0.05$ ) (Table 6).

## Discussion

Road traffic accidents are the leading cause of death in children worldwide [1, 2]. Studies have demonstrated that age-appropriate restraints provide improved safety for children, reducing the risk of road traffic injuries by 71–82% compared to seat belt use alone [12, 13].

The purpose of this study was to assess the population's knowledge and commitment to child car safety seats after the implementation of new traffic regulations in Saudi Arabia.

In our study, we found that 60.2% of participants reported using CSSs for their children. This is higher than the 47.3% reported in a study conducted in Taif [1] and the 37.5% in another study conducted in Jeddah [11, 15]. Additionally, 44.0% of our participants reported always using the CSS, compared to 39.0% in Unaizah [2] and 27.1% in Jeddah [11]. In China, a mere 0.6% of children were observed being restrained using CSSs or booster

seats and only 8.7% with seat belts. Despite this, 62% of respondents in China agreed on the necessity of using child restraints while traveling in a car [14].

It was reported that among children under 13 years old, sitting in the front seat increases injury risk by 40% compared to sitting in the rear. However, for children over 13 years of age who are appropriately restrained, there is no increased risk of injury associated with sitting in the front. Consequently, the American Academy of Pediatrics and the National Highway Traffic Administration recommend that children under 13 years of age sit in the rear seats. Unrestrained children sitting in the front face the highest risk of road traffic injuries, while appropriately restrained children in the rear are at the lowest risk [13].

The present study revealed that regarding the reasons for not using CSSs, 24.2% reported that the seat takes up too much space in the car, 19.1% considered it too expensive, and 13.9% cited a lack of information. These findings from our study differ from those of other studies where the primary reason was a lack of information [2]. This difference could be attributed to each KSA region residents' perception of how they can protect their child when riding in a car.

The overall knowledge level among participants was poor in 71.3% of the participants. In our study, among the demographic factors that were significantly associated with good knowledge level were age and education. As good knowledge was significantly higher among participants aged 31–40, 36.5% of participants with postgraduate degrees had significantly a good knowledge level compared to other educational levels.

Similar results were observed in previous study, where parents' education level and their knowledge level were found to be significantly correlated. Parents' knowledge about care safety increased with the number of children, but there was no significant correlation

**Table 6** Multivariate logistic regression analysis of the independent predictors of good knowledge among studied participants

Variable	B	Wald	p-value	Odds ratio (CI: 95%)
Age	1.6	3.31	0.031*	1.23 (1.99–3.64)
Gender	0.32	0.08	0.176	0.2 (0.45–1.98)
Education	3.98	2.68	0.013*	1.94 (1.67–4.94)
Monthly income	0.34	0.39	0.081	0.31 (0.52–1.97)
Having children less than 3 years	0.31	0.62	0.189	0.53 (0.62–1.87)
Having children aged 8–12 years	0.27	0.45	0.671	0.3 (0.16–1.63)
Did you know that there has been an irregularity of about 300–500 Saudi Riyal for children under 10 years and sitting in the front seat/not using child car seats in Saudi Arabia?	3.78	6.83	0.002*	2.75 (1.87–4.9)
Do you know that there has been an irregularity of about 150–300 Saudi Riyal if a child is not using the seat belt in Saudi Arabia?	2.18	2.91	0.003*	1.97 (1.55–4.19)
Do you use a child car safety seat?	2.76	3.41	0.006*	1.75 (1.9–5.01)

\* a significant relationship at a p-value of <0.05



between knowledge level and gender or number of children [16, 17]. At the same time, comparable results were revealed in a study done on Turkish parents [15].

Systematic reviews of intervention programmes to increase CCR use show that while education-only programmes are insufficient, there is evidence for the effectiveness of child safety seat laws, and education paired with incentive, distribution or enforcement programmes [18, 19].

## Conclusion

Our study population generally holds a positive attitude towards CSSs, with a high prevalence of usage and awareness of their importance. However, knowledge about age-appropriate seat types was relatively low, indicating limited understanding about the upper age limit and different seat types for child car safety. We recommend that traffic departments and the Ministry of Health collaborate to enhance this knowledge through awareness campaigns, educational videos, and posters on social media platforms.

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## Authors' contributions

Alsaeigh A, wrote a paragraph of the introduction and minor part of the discussion and the conclusion part, analysis and interpretation of data, references design, and approved the submitted version. ESH, wrote part of the method, designed the questionnaire, references design, analysis, interpretations of data, and approved the submitted version. WA, wrote the methodology section, analyzed and interpreted the data, and approved the submitted version. MA, wrote a paragraph in the introduction, followed up on the questionnaire, analyzed and interpreted the data, and approved the submitted version. AA, wrote the main part of the discussion, analysis and interpretation of the data, and approved the submitted version. LA, wrote parts of the introduction, discussion, and conclusion, revised the manuscript, and approved the submitted version.

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## Availability of data and materials

Not applicable.

## Declarations

## Ethics approval and consent to participate

Ethical approval for the study was obtained from the Medical Ethics Committee of Umm Al-Qura University in Saudi Arabia, with the ethical approval number: HAPO-02-K-012–2023-02–1428.

## Consent for publication

Not applicable.

## Competing interests

The authors declare that they have no competing interests.

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