

Practice in child restraint system use among attendees of Well-baby clinics in Jeddah, Saudi Arabia

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ABSTRACT

Background: The systematic use of child restraint system (CRS) while driving has been promoted by the WHO to improve road safety. **Objectives:** To assess the levels of practice in CRS use for children aged ≤ 5 years among mothers attending the Well-baby clinics and to explore the associated factors and attitudes. **Methods and Material:** A cross-sectional study was conducted among mothers visiting the Well-baby clinics at five primary health care centers in Jeddah, Saudi Arabia, using a multistage stratified-cluster sampling. Practice in CRS was assessed by interviewing the participants regarding the availability of a CRS in their car, usage frequency for a child < 5 years, and alternative child-sitting methods. Sociodemographic data, further road safety parameters, and attitudes were analyzed as independent factors of adequate practice using multivariate logistic regression. **Results:** Of the 192 included mothers, eight (4.2%) had a history of accident while driving with a child. Majority of the participants (62.5%) declared not having their cars equipped with a CRS and used inappropriate car-sitting methods. Of the 37.5% who had CRS in their cars, 27.1% declared using it always or frequently. Adequate practice in CRS was independently associated with mother's age (OR = 0.91, $P = 0.09$), low (OR = 0.10, $P = 0.001$) and moderate family income (OR = 0.23, $P = 0.012$), and the belief that CRS is not essential while driving with children (0.32, $P = 0.023$). **Conclusions:** There is inadequate practice in child road safety among families attending the Well-baby clinics in Western Saudi Arabia, which is associated with several misconceptions and negative attitudes towards the utility of CRS.

Keywords: Car seat, children, practice, restraint, road safety, Saudi Arabia

Introduction

Despite the reinforced traffic regulation laws, child road safety remains a public health concern of particular magnitude, resulting in substantial morbidity and mortality.^[1-5] The systematic use of appropriate CRS is promoted by the World Health Organization (WHO) among the key measures to improve child road safety,^[6] based on consistent body of evidence.^[7-11]

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This study aims at assessing the levels of mothers' awareness and practice in the use of CRS for their children, and exploring the sociodemographic factors, road safety parameters, and attitudes towards CRS that determine such a practice.

Subjects and Methods

Design and settings

A cross-sectional study was conducted in Well-Baby Clinics, at five primary health care centers (PHCCs) in Jeddah, Saudi Arabia, between Aug 1, 2020 and Sep 30, 2020. This study was approved

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by the institutional review board of the Directorate of Health Affairs, Ministry of Health, Jeddah (IRB number: H-02-J-002).

Population and sampling

All mothers attending the participating centers during the study period were eligible. Non-consenting mothers and incomplete participations were excluded. The sample size ($N = 192$) was calculated to detect 19% of adequate CRS use, as reported in a previous study by Alsanea *et al.*^[12] in Riyadh city, with 80% statistical power, 5% margin error, and 95% confidence interval.

A multistage stratified-cluster sampling was used. Jeddah has a total of 47 PHCCs, which are stratified into five clusters according to their affiliation with the referral tertiary hospital (each tertiary care hospital has 6–12 PHCCs). In stage one, one PHCC was randomly selected from each cluster. In Stage two, a convenience sampling was used to include 38–39 attendees from each participating PHCC.

Tools and variables

A semi-structured questionnaire developed by Alsanea *et al.*^[12] was used in this study, after obtaining a written authorization from the author. The questionnaire comprised four parts. Part one included sociodemographic data. Part two explored the practice in CRS, including its availability in the car, frequency of use, alternative child-sitting methods, and knowledge sources about CRS. Part three explored further road safety parameters, including parent's adherence to car seat-belt use, history of car accident while child on board, and child outcome, if applicable. Part four explored attitudes towards CRS including six items such as opinions about importance, affordability and types of CRS, using a five-level agreement Likert-type scale.

Adequate level of practice in CRS was defined using two criteria:

1. Availability of the system in the participant's car and 2) its frequent use (often or always).

Procedure

The research team attended the participating centers 2 days per week, approached eligible participants, explained the importance and objectives of the study, and collected verbal consent of the participants. Afterwards, the questionnaires were distributed regarding self-administration.

Statistical methods

Hard copies of the filled-in questionnaires were collected and entered in an Excel sheet, which was cleaned and coded, and then transferred to SPSS, version 21 for Windows (IBM SPSS Inc., Chicago, IL, USA) for statistical analysis. Descriptive statistics were used to present the sociodemographic data as well as the pattern of answers to other questionnaire parts. Internal consistency of the attitude scale was analyzed by calculation of Cronbach's alpha. The association between the level of practice in CRS use (adequate versus inadequate) and the sociodemographic factors, road safety parameters and attitude towards CRS were

analyzed using Chi-square test or Fisher's exact test for categorical variable, and independent t-test for numerical variables. A P value of < 0.05 was considered as statistically significant.

Results

Participants' characteristics

One hundred and ninety-two mothers have completed the questionnaire, whose mean (SD) age was 30.3 (6.4) years. Majority (96.9%) had at least one child < 5 years and 51.1% had university or higher educational level. Road safety parameters showed inadequate frequency of car seat-belt use in 38.0% and eight (4.2%) declared having history of car accident while driving with a child. These accidents resulted in simple wounds and bruises in one out of the eight children [Table 1].

Practice in CRS use

Majority of the participants (62.5%) declared that their cars were not equipped with a CRS. The participants reported that the child used to sit on the passenger's lap in front (62.5%) or back seats (18.3%), or directly in the front seat with (33.3%) or without car seat belt (17.5%) as the most frequent alternative child-sitting methods. Among the 37.5% participants who declared having a CRS, only 18.2% used it regularly, while the remaining used alternative methods [Figure 1]. The percentage of mothers/families having adequate practice in CRS was estimated as 27.1% (95% CI = 20.9–34.0%).

Sources of knowledge

The major source of knowledge about CRS was internet and social media (49.0%), while health authority stood for only 12.5% of the sources [Figure 2].

Attitudes towards CRS

Levels of agreement to the different attitude dimensions are presented in Table 2 using both raw attitude scores and binomial transformation into positive versus negative attitude. Positive attitude rates ranged from 27.1% (for opinion that CRS is not important for children > 2 years old) to 84.4% (for self-assessed knowledge about CRS). Of note, 37.5% of the participants did not agree that CRS is essential while driving with children and 47.4% believed that it is only important when driving fast.

Using the binomial variables, the internal consistency of the attitude scale showed Cronbach's alpha = 0.613. An attitude score (range 0–6, mean = 3.65, SD = 1.58) was calculated, with higher scores indicating more positive attitude regarding CRS.

Factors associated with adequate practice

Adequate practice in CRS was associated with younger mother's age ($p = 0.017$), higher educational level ($p = 0.012$), and higher family income ($p = 0.001$). Notably, regular use of car seat belt by parents was associated with higher percentage of adequate practice (31.9% versus 19.2%); however, the difference was not statistically significant ($p = 0.054$) [Table 3].

Table 1: Participants' characteristics (n=192)

Parameter	Category	Frequency	Percentage
Sociodemographic data			
Mother's age (years)	Mean, SD	30.3	6.4
Educational level	Below secondary	23	12.0
	Secondary	71	37.0
	Bachelor	86	44.8
	Higher education	12	6.3
Nationality	Saudi	140	72.9
	Non-Saudi	52	27.1
Family income (SAR)	<5k	68	35.4
	5-10k	73	38.0
	10-15k	29	15.1
	15-20k	15	7.8
	>20k	7	3.6
No. of children <5 years	None	6	3.1
	1	129	67.2
	2	53	27.6
	3+	4	2.1
Road safety parameters			
Frequency of parent's use of car seat belt	Always	95	49.5
	Often	24	12.5
	Sometimes	39	20.3
	Rarely	15	7.8
	Never	19	9.9
History of car accident while driving with a child	No	183	95.3
	Yes	8	4.2
	No answer	1	0.5
Protection method used for child*	CRS	4	2.1
	Car seat belt	3	1.6
	No protection	1	0.5
Child's outcome*	No injury	7	3.6
	Simple wounds or bruises	1	0.5

*Variables related to positive history of car accident (n=8)

Table 2: Attitudes towards child restraint system (n=192)

Parameter	Attitude score					Attitude level	
	1	2	3	4	5	Negative	Positive
CRS is an essential device while driving with children	12 (6.3)	27 (14.1)	33 (17.2)	85*(44.3)	35* (18.2)	72 (37.5)	120 (62.5)
I have enough information about child restraint system	1 (0.5)	8 (4.2)	21 (10.9)	93*(48.4)	69* (35.9)	30 (15.6)	162 (84.4)
CRS is expensive	73*(38.0)	66* (34.4)	14* (7.3)	29 (15.1)	10 (5.2)	39 (20.3)	153 (79.7)
CRS is only important when driving fast	53*(27.6)	48* (25.0)	38 (19.8)	49 (25.5)	4 (2.1)	91 (47.4)	101 (52.6)
CRS is not important for children above 2 years old	18*(9.4)	34* (17.7)	69 (35.9)	50 (26.0)	21 (10.9)	140 (72.9)	52 (27.1)
For each child age group there is special seat and certain way of use	6 (3.1)	17 (8.9)	57 (29.7)	86*(44.8)	26* (13.5)	80 (41.7)	112 (58.3)

Attitude: 1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly agree. *Levels classified as positive attitude

Association between attitude and levels of practice

Overall, positive attitude towards CRS was associated with significantly higher percentages of adequate practice ($p < 0.05$), with the exception of self-assessed knowledge ($p = 0.075$) [Table 4]. Further, univariate logistic regression showed that attitude score was a significant factor of adequate practice in CRS (OR = 1.83 [95% CI = 1.40–2.39], $P < 0.001$).

Predictors of levels of practice

Multivariate regression showed that adequate practice was independently associated with mother's age (OR = 0.91 [95%

CI = 0.85–0.98], $P = 0.009$), low (0.10 [0.03–0.36], $P = 0.001$) and moderate family income (0.23 [0.08–0.72], $P = 0.012$), and belief that CRS is essential (0.32 [0.12–0.85], $P = 0.023$) [Table 5].

Discussion

Summary of findings

Findings from the present study reveal an alarming figure of unawareness about road safety in children among mothers attending the Well-baby clinics, with approximately one quarter

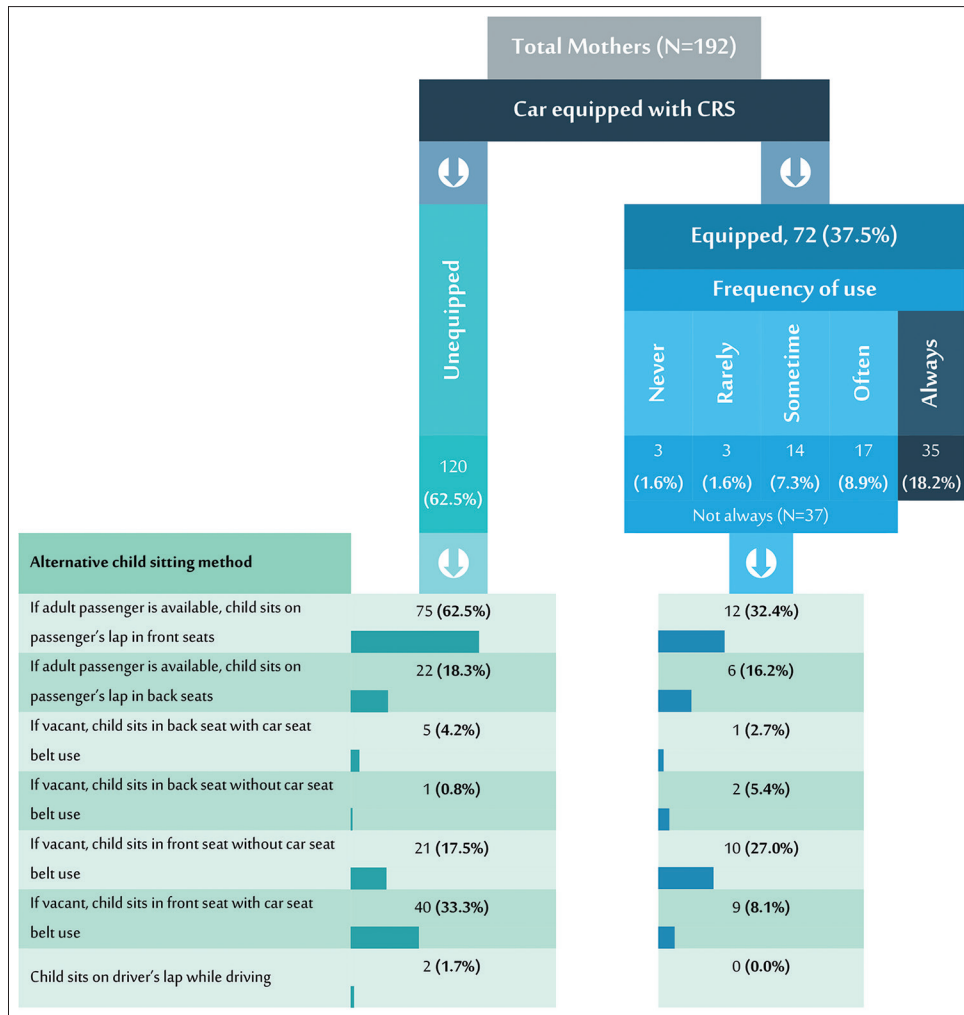


Figure 1: Practice in child restraint system use. CRS: Child restraint system

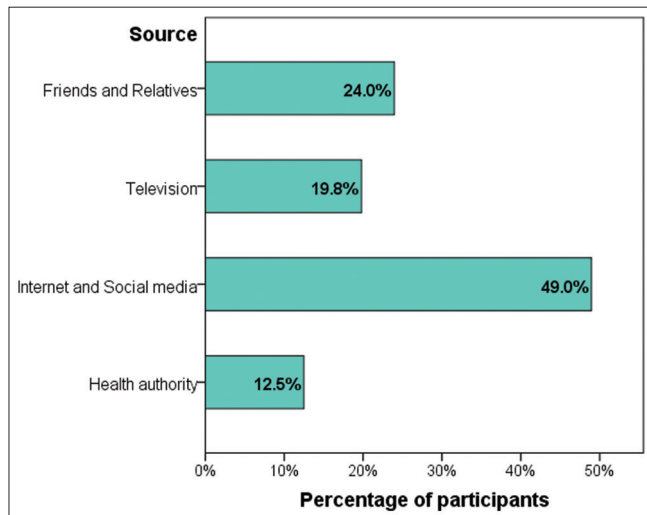


Figure 2: Sources of knowledge about child restraint system. Bars represent the percentage of participants who declared having acquired their knowledge about the child restraint system from the given source. Both figures are original

of them only having an adequate practice in CRS use for their children aged ≤5 years. These figures are more worrying among

participants with low socioeconomic and educational status, and are associated with several misconceptions about the utility and importance of CRS. Such misconceptions may induce misuse among users, which further increase the risk of injuries in case of MVC.^[9,13]

Quantitative and qualitative indicators of inadequate practice in child restraining

Only 37.5% of the participants have equipped their cars with CRS and only 27.1% are using CRS adequately while driving with a child. Reports from the other local studies showed comparable patterns of CRS practice. A study from Riyadh,^[12] which involved 385 families, showed that only 36.6% of the cars were equipped with CRS while only half of these had adequate use of CRS, representing approximately 19.0% of the total, which is lower than the 27.0% found in the present study. In the Eastern Province, where the mortality related to MCVs is the highest in the country, approximately 50.0% of parents claimed to use CRS regularly while driving with their children.^[14] Another study from Unaizah City surveyed 350 parents regarding their practice in child restraining while driving and 39.0% of them declared using the child seat on a regular basis, and 42.7% declared putting

Table 3: Factors associated with adequate practice in child restraint system (n=192)

Parameter	Category	Practice level in CRS				P
		Inadequate		Adequate		
		n	%	n	%	
Mother's age (years)	Mean, SD	31.0	6.8	28.5	5.1	0.017* ^t
Educational level	Below secondary	21	91.3	2	8.7	
Nationality	Secondary	56	78.9	15	21.1	0.012* ^t
	University+	63	64.3	35	35.7	
	Saudi	99	70.7	41	29.3	
Family income (SAR)	Non-Saudi	41	78.8	11	21.2	0.260
	<5k	58	85.3	10	14.7	
	5-10k	52	71.2	21	28.8	
	10-15k	21	72.4	8	27.6	
No. of family members	>15k	9	40.9	13	59.1	0.001* ^t
	Up to 3	45	65.2	24	34.8	
	4-5	62	73.8	22	26.2	
	6+	33	84.6	6	15.4	
No. of children <5 years	None	6	100.0	0	0.0	0.090
	1	93	72.1	36	27.9	
	2+	41	71.9	16	28.1	
Frequency of parent's use of car seat belt	Rarely or never	26	76.5	8	23.5	0.316
	Sometimes	33	84.6	6	15.4	
	Often	17	70.8	7	29.2	
	Always	64	67.4	31	32.6	
Use of seat belt	Sometime or less	59	80.0	14	19.2	0.216
	Often or always	81	68.1	38	31.9	

CRS: Child restraint system. *Statistically significant result (P<0.05). Test used: ^tindependent t-test; otherwise, Chi-square test was used

Table 4: Association between attitude and levels of practice in child restraint system (n=192)

Attitude towards CRS		Practice level in CRS				
Dimension	Level	Inadequate		Adequate		P
CRS is an essential device while driving with children	Negative	64	88.9	8	11.1	<0.001* ^f
	Positive	76	63.3	44	36.7	
I have enough information about child restraint system	Negative	26	86.7	4	13.3	0.075 ^f
	Positive	114	70.4	48	29.6	
CRS is expensive	Negative	34	87.2	5	12.8	0.027* ^f
	Positive	106	69.3	47	30.7	
CRS is only important when driving fast	Negative	76	83.5	15	16.5	0.002* ^t
	Positive	64	63.4	37	36.6	
CRS is not important for children more than 2 years old	Negative	110	78.6	30	21.4	0.004* ^t
	Positive	30	57.1	22	42.3	
For each child age group there is special seat and certain way of use	Negative	65	81.3	15	18.8	0.028* ^t
	Positive	75	67.0	37	33.0	

CRS: Child restraint system. *Statistically significant result (P<0.05). Test used: ^fFisher's exact test; otherwise, Chi-square test was used

the baby seat in the car where applicable.^[15] The combination of these local figures denotes a considerable backlog in child road safety awareness in the Kingdom compared to some international data reporting better practice in CRS.

A study from the US investigated the pattern of use and misuse of CRS among 4,000 vehicles in six different states, and showed that 51.0%–75.0% of the children were restrained using a CRS, while only 5.0%–21.0% were unrestrained. Further, the same study showed that children with higher-weight were more likely to be unrestrained.^[16] In southeastern Norway, 100.0% of 1,260 child occupants of 684 investigated vehicles were

restrained in a CRS or seat belt; however, qualitatively, restraint misuse was observed in 38.0%. Further, authors observed that CRS misuse was significantly more common in age groups 0–3 years (~45.0%) and 4–7 years (~60.0%), with critical or severe errors found in majority of cases.^[13] Although these observations demonstrate higher levels of compliance with CRS than in the present study, they are considered as insufficient in their respective countries and support the need to strengthen the education and information strategies to improve the usage of CRS among the drivers. By contrast, other countries showed even lower levels of practice in CRS compared to the present study. For example, a regional study from Russia that surveyed nearly

Table 5: Independent factors associated with adequate practice in CRS

Predictor	Category	OR	95%CI		P
Mother's age	(Years)	0.91	0.85	0.98	0.009*
Mother's educational level	Below secondary	0.66	0.12	3.59	0.634
	Secondary	0.62	0.27	1.42	0.261
	University+	Ref	-	-	0.515
Family monthly income (Saudi riyal)	Low (<5k)	0.10	0.03	0.36	0.001*
	Moderate (5-15k)	0.23	0.08	0.72	0.012*
	High (>15k)	Ref	-	-	0.002*
CRS is an essential device while driving with children	Negative attitude	0.32	0.12	0.85	0.023*
I have enough information about child restraint system	Negative attitude	1.01	0.27	3.75	0.984
CRS is expensive	Negative attitude	0.80	0.25	2.54	0.709
CRS is only important when driving fast	Negative attitude	0.46	0.20	1.01	0.054
CRS is not important for children more than 2 years old	Negative attitude	0.55	0.25	1.22	0.139
For each child age group there is special seat and certain way of use	Negative attitude	0.90	0.39	2.05	0.794

Multivariate binary logistic regression; dependent variable: adequate practice in CRS. OR: Odds ratio; 95% CI: 95% confidence interval. Ref: Category used as reference to calculate OR. * Statistically significant result

40,000 drivers and passengers, in approximately 24,800 vehicles, showed only 11.0% of CRS use in vehicles transporting children, while seat belts' usage was observed among 55.0% of the drivers and 58.0% of the front seat passengers.^[17] Similarly, a Chinese study showed that only 13.0–15.3% of preschool children were restrained, and the overall rate of CRS use was nearly 10.0%.^[18] This demonstrates that road safety in children remains a global regulatory and public health concern.

Furthermore, the present study demonstrated that a substantial percentage of parents declared using inappropriate alternative methods to restraint their children, most commonly by seating the child on the passengers' lap, either in front or back seats, or by using the adult car seat belt. These findings are concerning, given the high risk of injury or death associated with such practices. Adequate protection of children, notably those aged below 5 years, requires the use of an approved child seat, which is adapted for the age and size. Otherwise, injuries and trauma may rise from the seat belt itself.^[19] In sum, the figures highlighted in the present study should elicit interest among healthcare professionals, notably those working in the primary care and preventive medicine, who should be actively involved in raising awareness about the issue among the parents to reduce the incidence, morbidity, and mortality of child injuries associated with MCVs.

Attitudes and factors associated with adequate CRS use

The present study showed a number of sociodemographic factors associated with low levels of practice in CRS use, including older mother's age, low educational or socioeconomic level. However, educational level of the mother was not significant in adjusted analysis suggesting that it was confounded with age in a generational effect. By contrast, the previously mentioned Russian study showed that compliance with seat-belt use was observed more frequently among older individuals and less frequently among those with higher education.^[17] This may denote a generational effect, suggesting that in Russia the aged population is more compliant with the rules, while in Saudi Arabia

the younger population has better awareness and are educated regarding road safety measures.

However, levels of practice were also associated with the attitudes towards CRS, notably negative attitude regarding the essential nature of CRS and misbelief that it is only essential while driving fast. A study by AlSallum *et al.*^[15] showed that lack of awareness about the importance of CRS was among the commonly reported reasons for not using it, besides misbelief that CRS is not adapted for younger children or the child refusing to be restrained in the child seat. This demonstrates that exploring people's beliefs and correcting their misconceptions are equally essential measures to promote the uptake of CRS. Several other misconceptions were demonstrated to act as barriers to CRS use. A systematic synthesis of qualitative studies highlighted several dimensions, such as lowly perceived risk of injury, underestimation of the safety benefit of CRS, use of CRS to discipline children rather than for safety purpose, etc., Further, authors noted great variations in the perceptions and attitudes between countries and cultures.^[20]

Another factor to be considered is the affordability of the CRS, which may constitute a barrier to its use. In the present study, 20.3% of the participants considered CRS to be expensive, which was associated with a significant reduction in the rate of adequate use. A study from South Africa identified high cost as the most frequent reason for not owning a child seat.^[21] Besides these factors, practice in CRS may be related to the practice in driver's road safety measures. A study from the USA showed that inadequate practice in CRS was observed in more than 50% of unbelted drivers versus only 8% in belted ones.^[22]

Critical need for firm legislation of road safety for children

With regards to the evidence presented in this study, in combination with other local reports, implementation of the child restraint legislation should be enforced in Saudi Arabia. The WHO Global Status Report on Road Safety 2018 showed that only 33 countries had laws meeting the optimal practice on CRS in 2017, representing only 0.65 billion people covered by

such practice worldwide.^[6] The same report stated that Saudi Arabia was among the countries, which did not meet the optimal practice, owing to absence of age/height-based regulation and front seat restrictions. Furthermore, the level of enforcement of child restraint law in Saudi Arabia was previously rated by the WHO as two on a scale of 10.^[11] Consequently, there is an urgent need to increase the national level of enforcement of the child restraint law to improve road safety in children. Early reports evaluating the impact of mandatory CRS laws in the United States showed up to 34.0% reduction in child fatality besides significant effect in decreasing the severity of injuries.^[23-25] In Chile, the implementation of CRS law was associated with immediate 24.0% reduction in severe child injuries per vehicle, and this effect persisted for a period of 2–3 years, after which the trend in injuries started increasing.^[26] Further, a European study analyzed the cost-effectiveness of child restraint measures among 29 road safety measures, and concluded that such measures are cost-effective. Authors concluded with the importance of investigating the efficiency and cost-effectiveness of the road safety measures by the scientists to analyze the gaps and improve the strategies.^[27]

However, such positive impact is not generalizable throughout the countries, as it is likely to depend on other factors related to the societal, cultural, and policy implementation context. In Japan, for example, implementation of the child restraint law in 2000 did not significantly reduce child fatality or injury, owing to a low level of enforcement by authorities and non-deterrent amount of the penalties, besides poor understanding of the correct installation of the CRS among target users.^[28] In China, absence of law enforcement and lack of adequate knowledge and awareness accounted for 44.0% and 24.3% of the reasons mentioned for not using CRS, respectively.^[18] On projection to the case of Saudi Arabia, the present study showed that only 12.5% of the participants declared that they have awareness about CRS through information provided by the health authority. This suggests that, besides enforcing the existing regulation, further efforts should be made to design and conduct more effective awareness campaigns to promote the use of CRS among the Saudi population.

Further, beyond these issues, the highest consideration should be given to crucial technical aspects, which define and regulate requirements for marketing approvals of different devices, and conduct field tests to validate each device. Subsequently, validated devices could be notified with a security label that enables the informed consumer to make a committed choice when purchasing the CRS. The validation tests use sensor-equipped dummies that are subjected to crash simulations, with measurement of the forces, accelerations, and movements of critical parts of the dummy body such as head, neck, chest, and abdomen. The different devices are methodically tested to check their effectiveness in controlling the previously mentioned parameters during a crash, by keeping the values within the safe ranges. For instance, by assessing the safety of five commercial devices in Poland, one of them did not the

meet criteria of the new Regulation No. 129 of the Economic Commission for Europe of the United Nations (UN/ECE).^[29] The continuous advance in technology and computer science will probably contribute in improving road safety of children by enabling accurate assessments and understanding of the injuries and designing and manufacturing safer devices, with the condition that the regulations and people's awareness are updated accordingly.

Limitations

The generalizability of the present findings is limited by the study design, notably the setting enrolling only mothers attending the Well-baby clinics in a given region, as well as the self-reported assessments impacting the reliability of the answers. Such design is subject to several types of bias such as selection bias, recall bias, and social desirability bias.

Conclusions

There is inadequate practice in child road safety among families attending the Well-baby clinics in Western Saudi Arabia, which is associated with several misconceptions and negative attitudes towards the utility and importance of CRS. We highlight four critical dimensions that should be considered at the regulatory and public levels, regarding an effective strategy to improve road safety in children in the Kingdom. At the regulatory levels, CRS devices should be submitted to a methodic and evidence-based safety accreditation process by a competent institution prior to their marketing approval. Besides, child restraint laws should be enforced notably through increasing the amounts of penalties and reinforcing police controls. At the public level, people's attitudes and beliefs about CRS should be thoroughly investigated to alleviate eventual misconceptions and determine the facilitators and barriers to CRS use. Based on such investigations, awareness raising campaigns should be designed and conducted in preparation and in concomitance with the implementation of the law enforcement. The role of primary care practitioners and preventive medicine physicians is crucial in the successful implementation of such awareness raising campaigns.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms.

Key Messages

There are alarming figures of unawareness about child road safety among mothers attending the Well-baby clinics, including low levels of use of child restraint system (CRS). This is associated with low socioeconomic and educational status, along with several misconceptions that should be alleviated to improve child road safety.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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