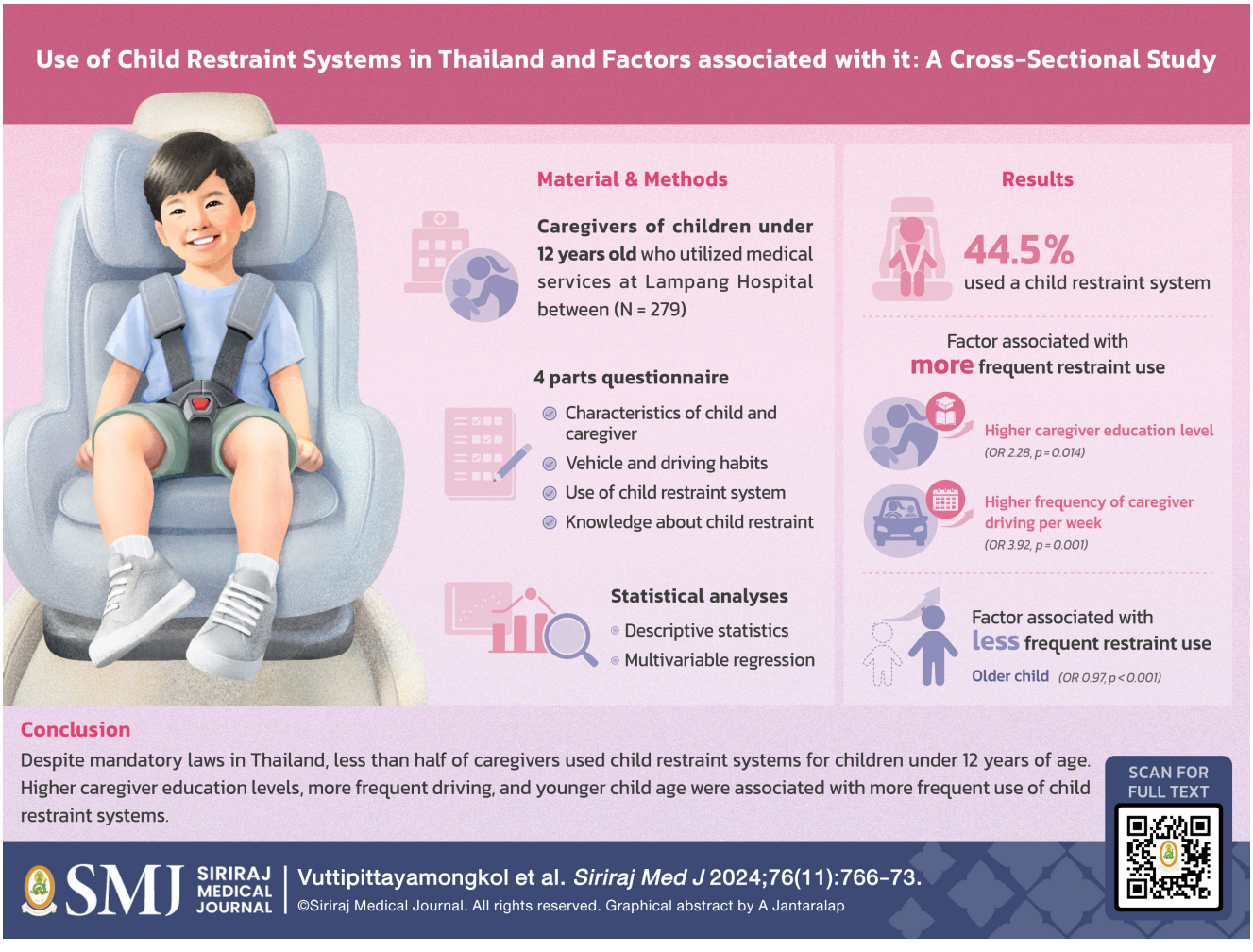
Use of Child Restraint Systems in Thailand and Factors associated with it: A Cross-Sectional Study

Pakawadi Vuttipittayamongkol, M.D.[1], Roungtiva Muenpa, Ph.D.[2], Prakasit Wannapaschaiyong, M.D.[3,*]

[1]Department of Pediatrics, Lampang Hospital, Lampang 52000, Thailand, [2]Department of Pharmacy, Lampang Hospital, Lampang 52000, Thailand, [3]Department of Pediatrics, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.



**Corresponding author: Prakasit Wannapaschaiyong*
E-mail: prakasit.wan@mahidol.ac.th
Received 15 June 2024 Revised 30 July 2024 Accepted 30 July 2024
ORCID ID:http://orcid.org/0000-0001-7099-0183
https://doi.org/10.33192/smj.v76i11.269751

All material is licensed under terms of the Creative Commons Attribution 4.0 International (CC-BY-NC-ND 4.0) license unless otherwise stated.

ABSTRACT

Objective: To determine the use of child restraint systems among caregivers of children in Thailand and to identify factors associated with it.

Materials and Methods: Caregivers of children under 12 years old who utilized medical services at Lampang Hospital between March 2023 and March 2024 were asked to participate in this cross-sectional study. Data on characteristics of child and caregiver, driving behavior, and knowledge about child restraint systems were collected via a questionnaire. Multivariable regression was applied to analyze associated factors.

Results: Of the 322 eligible caregivers, 279 (86.6%) participated, of which 127(44.5%) used a child restraint system. A higher caregiver education level (odds ratio [OR] 2.28, 95% CI 1.18; 4.39), and driving 3–7 days per week (OR 3.92, 95% CI 1.82; 8.40) were associated with more frequent restraint use. A higher age of the child (OR 0.97, 95% CI 0.96; 0.98) was associated with less frequent restraint use.

Conclusion: Fewer than half of the caregivers utilized child restraint systems. Higher caregiver education levels and more frequent driving were associated with more frequent use, while older child age was associated with less frequent use of child restraint systems. Targeted interventions are needed to improve the use of child restraint systems.

Keywords: Car seats; caregiver knowledge; child restraint systems; Thailand (Siriraj Med J 2024; 76: 766-773)

INTRODUCTION

Road traffic accidents are a leading cause of child mortality worldwide, with the World Health Organization reporting over 186,300 annual deaths in children under 18 years of age.[1] Those who survive these accidents frequently end up with lifelong disabilities.[1] The non-use of a child restraint system is a primary contributor to child road fatalities.[2]

Child restraint systems include all devices and components used to secure children safely in vehicles. Child restraint seats, also known as child safety seats or car seats, are designed to accommodate the small size of infants and young children and to provide protection in case of an accident. Safety belts are the standard restraints built into vehicles for older children and adults. They are not designed for younger children and do not provide protection in case of an accident.[3]

Prior research has identified various factors associated with the use of child restraint systems. Family-level factors associated with more frequent use include higher parental education[4,5], higher household income[4,6], prior accident experience[7], and caregiver awareness of the importance of using child restraints.[8-10] Environmental factors, such as rural roads and nighttime travel, have been associated with less frequent use of child restraint system.[11]

In Thailand, between 2017 and 2021, road accidents claimed the lives of 1,155 children aged 0-6 years. Of these fatalities, 221 occurred while the children were passengers in vehicles. The same survey revealed that 96.5% of children who died as passengers were not using a child restraint system.[12]

Thailand enacted a law in May 2022 mandating the use of child restraint seats for passengers under 6 years old. Children under 135 cm tall were also required to use a safety belt or child restraint seat, regardless of their seating position.[13] However, no surveys have examined the actual usage rates of child restraint systems or the associated factors since the law's enactment. This study aimed to assess the use of child restraint systems among caregivers of children aged under 12 years in Thailand and to identify factors associated with it. Understanding these factors may be important for promoting the use of child restraint systems and thereby improving child passenger safety.

MATERIALS AND METHODS

Study design and population

This observational cross-sectional study targeted caregivers of children under 12 years old who utilized medical services at Lampang Hospital between March 2023 and March 2024. A previous study[7] found an 82% use of child restraint systems among caregivers. To estimate the current use we applied the population proportion formula to determine the sample size. A 5% margin of error and a 95% confidence level resulted in a sample size of approximately 280 participants. The inclusion criteria were possession of a private vehicle, literacy in reading and writing in Thai, and driving with a child less than 12 years of age.

Data collection

The Lampang Hospital Ethics Committee for Human Research approved the study protocol (EC 27/66). Caregivers

who met inclusion criteria were invited to participate and complete a questionnaire. The research assistant was available solely to answer any questions the participants had regarding the survey items.

The questionnaire assessed 4 domains, including characteristics of child and caregiver, vehicle and driving habits, use of child restraint system, and knowledge about child restraint systems. The characteristics included age, sex, weight, height, and underlying medical conditions of the child, as well as age, sex, marital status, monthly household income, education level, and occupation of the caregiver. Vehicle and driving information included vehicle type, frequency and duration of driving or riding with the child, distance driven with the child per week, prior motor vehicle accident experience, and caregiver safety belt usage.

Use of child restraint systems included familiarity with child restraint systems, their usage of such systems, and their reasons for using or not using the systems. This questionnaire section included open-ended questions to gather qualitative data on caregivers' reasons for their choices. These questions were: "Why do you choose to use a child restraint system?" (for users), and "Why do you choose not to use a child restraint system?" (for non-users). Participants were encouraged to provide detailed responses. The research team conducted a thematic analysis of these responses. Two researchers independently coded the responses, identifying recurring themes. They then compared their findings and resolved any discrepancies through discussion to reach a consensus on the main themes representing reasons for the use and non-use of child restraint systems.

Knowledge about child restraint systems was assessed by means of 5 multiple-choice questions, each with 4 options, and respondents must select the single most correct answer for each question. The questions addressed the effectiveness of standard safety belts alone in protecting children under 4 years old during motor vehicle accidents, the best position for a child restraint seat, the age range for which child restraint seats are required by traffic law, the most suitable child restraint system for children under 2 years old, and the correct installation of a 5-point harness in a child restraint seat. Caregivers who answered 4 or 5 of the knowledge questions correctly were categorized as having a good level of knowledge. The others were categorized as having a poor level of knowledge. Five experts with at least 10 years of experience in child restraint system research assessed the content validity of the knowledge questions. Interobserver reliability of the experts expressed in Cohen's kappa was 0.99. A pilot test was conducted with 30 individuals similar to the target sample. Internal consistency was analyzed Cronbach's alpha was 0.70.

Statistical analysis

Descriptive statistics were used to analyze the prevalence of child restraint system use, characteristics of caregivers and their children, caregiver driving practices, child usage patterns, and caregiver knowledge about child restraints. Chi-square and Fisher's exact tests were used to examine the associations between independent variables and the decision to use a child restraint system. Independent t-tests and Mann–Whitney U tests were used to analyze continuous data between caregivers who used child restraint systems and those who did not. Variables associated ($P < 0.05$) with system use were entered into a multivariable logistic regression model to control for potential confounders. All analyses were performed using IBM SPSS Statistics, version 25 (IBM Corp, Armonk, NY, USA), with statistical significance set at $P < 0.05$.

RESULTS

Caregiver and child

A total of 350 caregivers were screened for eligibility, of which 322 met the inclusion criteria. Of these potential participants, 279 agreed to participate. In total, 127 (44.5%, 95% CI 38.8%, 50.3%) used child restraint systems. Caregivers who used child restraint systems were significantly younger than those who did not use child restraint systems. Child restraint systems were significantly more often used in younger children (Table 1).

Socioeconomic factors

Caregivers who used child restraint systems were more likely to have a bachelor's degree or higher, be government officers or company employees, and have a monthly income exceeding 814 US dollars (Table 1).

Child health characteristics

An underlying disease in a child was significantly associated with more frequent use of a child restraint system (Table 1).

Caregiver driving behavior

Driving a sedan and more frequent driving was associated with more frequent use of child restraint systems (Table 2).

TABLE 1. Characteristics of participants and their children.

Characteristics	Use child restraint systems (N=127)	Do not use child restraint systems (N=152)	*P*
Caregiver variables			
Age[a] (year)	34.9 (7.3)	38.1 (10.8)	0.004
Sex			1.000
Male	23 (18.1)	28 (18.4)	
Female	104 (81.9)	124 (81.5)	
Marital status			0.247
Married	115 (90.5)	127 (83.5)	
Separated	9 (7.1)	18 (11.8)	
Single	3 (2.4)	7 (4.6)	
Education level			<0.001
Below bachelor's degree	44 (34.6)	107 (70.4)	
Bachelor's degree and above	83 (65.4)	45 (29.6)	
Occupation			<0.001
None/Student	18 (14.2)	35 (23.0)	
Freelance/Self-employed	47 (37.0)	84 (55.3)	
Government/Private enterprise	62 (48.8)	33 (21.7)	
Monthly income			<0.001
<814 US dollars[+]	18 (14.2)	67 (44.1)	
≥814 US dollars[+]	109 (85.8)	85 (55.9)	
Child variables			
Age[b] (months)	31 (14, 47)	59 (22.5, 95)	<0.001
Sex			0.229
Male	61 (48.0)	85 (55.9)	
Female	66 (52.0)	67 (44.1)	
Weight for age			0.541
Low (<3rd percentile)	11 (8.7)	18 (11.8)	
Average (3rd – 97th percentile)	111 (87.4)	125 (82.2)	
High (>97th percentile)	5 (3.9)	9 (5.9)	
Height for age			0.052
Low (<3rd percentile)	11 (8.7)	19 (12.6)	
Average (3rd – 97th percentile)	111 (87.4)	116 (76.8)	
High (>97th percentile)	5 (3.9)	16 (10.6)	
Underlying disease			0.001
No	95 (74.8)	91 (59.9)	
Yes	32 (25.2)	61 (40.1)	

Data are presented as numbers (percentages)

[+]1 UD dollar = 36.87 bahts

[a] Data are presented as means (standard deviations). [b] Data are presented as medians (interquartile ranges).

TABLE 2. Driving behavior and knowledge about child restraint systems among participants.

Independent variables	Use child restraint systems (N=127)	Do not use child restraint systems (N=152)	*P*
Type of vehicle			<0.001
Sedan	104 (81.9)	74 (49.0)	
Pickup	22 (17.3)	74 (49.0)	
Van	1 (0.8)	3 (2.0)	
Frequency of caregiver driving			<0.001
≤2 days/week	24 (18.9)	72 (47.4)	
3-7 days/week	103 (81.2)	80 (52.7)	
Frequency of caregiver safety belt use			0.547
Never used	1 (0.8)	0 (0.0)	
Used on some occasions	11 (8.6)	24 (15.8)	
Used on almost every occasion	115 (90.5)	124 (81.6)	
History of motor vehicle accidents			0.673
No	12 (9.5)	12 (7.9)	
Yes	115 (90.6)	140 (92.1)	
Knowledge about child restraint systems			0.011
Poor	48 (37.8)	81 (53.3)	
Good	79 (62.2)	71 (46.7)	

Data are presented as numbers (percentages).

Knowledge about child restraint systems

A good level of knowledge about using child restraint systems was significantly associated with the use of child restraint systems (Table 2).

Reasons for use and nonuse

The qualitative data analysis revealed that caregivers used child restraint systems primarily to prioritize the child's safety (97.6%) and to comply with legal requirements (67.7%). Conversely, the participants who did not use child restraint systems stated that the children under their care refused to use them (57.9%), that they felt it was inconvenient for travel (57.9%), and that child restraint systems, especially car seats, were expensive (30.9%).

Factors influencing caregiver use of child restraint systems

After adjusting for potential confounders, a bachelor's degree or higher was associated with more frequent use of child restraint systems, while a higher age of the child was associated with less frequent use of a child restraint system (Table 3). Driving more frequently was also associated with more frequent use of child restraint systems (Table 3).

DISCUSSION

The prevalence of use of child restraint systems in this study was 44.5%, a marked improvement from the 20%, reported in Thailand in 2015.[14] This increase likely reflects heightened awareness due to the legal mandate introduced in 2022. Despite this progress, more than half of caregivers still did not use these systems, indicating the need for further interventions to promote compliance and enhance child passenger safety.

This study revealed that several socioeconomic and behavioral factors were significantly associated with the use of child restraint systems, which is consistent with findings from other countries.[4-6] Higher levels of caregiver education were associated with increased restraint usage, likely due to enhanced knowledge and awareness about child safety practices among more educated individuals.[4,5,15]

TABLE 3. Result of Multivariable logistic regression analysis of factors associated with caregivers' use of child restraint systems.

Variable	Coef.	Std. Err	95% CI	OR	*P*
Caregiver variables					
Age	-0.01	0.02	0.96, 1.03	0.99	0.656
Education level					
Below bachelor's degree	Reference				
Bachelor's degree and above	0.82	0.33	1.18, 4.39	2.28	0.014
Occupation					
None/Student	Reference				
Freelance/Self-employed	-0.34	0.37	0.35, 1.47	0.71	0.359
Government/Private enterprise	-0.26	0.49	0.29, 2.02	0.77	0.594
Monthly income					
<814 US dollars[+]	Reference				
≥814 US dollars[+]	0.52	0.43	0.73, 3.92	1.69	0.222
Child variables					
Age	-0.01	0.02	0.96, 0.98	0.97	<0.001
Underlying disease					
No	Reference				
Yes	-0.19	0.34	0.42, 3.42	0.82	0.774
Caregiver driving characteristics					
Type of vehicle					
Sedan	0.79	1.30	0.59, 89.29	7.28	0.120
Pickup	1.99	1.28	0.17, 27.79	2.20	0.544
Van	Reference				
Frequency of caregiver driving					
≤ 2 days/week	Reference				
3-7 days/week	1.36	0.39	1.82, 8.40	3.92	0.001
Knowledge about child restraint systems					
Poor	Reference				
Good	0.23	0.32	0.67, 2.37	1.26	0.473

[+]1US dollar = 36.87 bahts

Abbreviations: OR, odds ratio; CI, confidence interval

Percentage correctly predicted: 75.3%

In other studies a higher household income was positively associated with the utilization of child restraint systems, as the financial burden of purchasing and installing these systems can be a barrier for lower-income families.[6,7]

Child age is inversely associated with the use of a child restraint system, with older children being less likely to be properly restrained. This trend may result from perceptions that older children are at reduced risk or no longer require restraints. Furthermore, older children are more likely to resist using restraints, making it challenging for caregivers to ensure that the children always use the systems.[10,16,17]

Caregiver driving behavior significantly influenced restraint practices. Caregivers who drove more frequently had greater odds of using child restraint systems, likely due to increased risk exposure from spending more time on the road and a heightened perceived need for restraint use.[18]

Although good knowledge about child restraint systems was more common among caregivers who used them, it did not emerge as an independent predictor after adjusting for other factors. This finding suggests that while education is important, other factors may have a greater impact on use of child restraint systems.[10]

The strengths of this study include the comprehensive assessment of various potential influences and the robust sample size. However, several limitations should be noted. The single-center design may limit the generalizability of our findings to other regions or populations in Thailand. The reliance on self-reported data may introduce recall bias, where participants may not accurately remember or report their behaviors. Furthermore, the presence of research assistant during data collection may introduce observer bias. To reduce observer bias researcher assistants had been trained to use a neutral tone and avoid using gestures that could guide responses. They were instructed not to judge participants based on their answers and maintain the confidentiality of research participants. The social desirability of using child safety devices could have further influenced participants to report more favorably on their behaviors.

Additionally, of the 322 eligible caregivers who were approached, 43 (13.4%) declined to participate. This non-participation could lead to selection bias if those who declined differed systematically from those who participated. However the non-participation is small relative to the total sample.

Future research could address these limitations through several approaches. Multi-center studies across different regions of Thailand would improve generalizability. Observational studies of actual child restraint system use, rather than relying solely on self-reports, could provide more accurate prevalence estimates. Anonymous surveys might reduce social desirability bias. Additionally, collecting basic characteristics from those who decline participation could help assess potential selection bias.

Despite these limitations, our findings provide valuable insights into the current state of child restraint system use in Thailand and the factors associated with their use. These results can inform targeted interventions to improve use rates. For instance, educational campaigns could focus on the importance of continued use as children grow older. Policies to make child restraint systems more affordable or accessible could address financial barriers.

Although legislative efforts have been made, the use of child restraint systems in Thailand remains suboptimal, indicating the need for additional measures. In addition to continuing education and awareness campaigns, tailored interventions targeting specific risk groups could help bridge the gap and enhance child passenger safety nationwide.

CONCLUSION

Despite mandatory laws in Thailand, less than half of caregivers used child restraint systems for children under 12 years of age. Higher caregiver education levels, more frequent driving, and younger child age were associated with more frequent use of child restraint systems.

ACKNOWLEDGMENTS

The authors express their gratitude to the individuals who participated in this study.

DECLARATION

Grants and Funding Information

This project is not funded by any external sources.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Author Contributions

All authors approved the final article. The authors were involved with the study: P.V. ; Conceptualization; Methodology; Investigation and data collection; and Writing–original draft. R.M. ; Investigation and data collection. P.W. ; Conceptualization; Writing–review and editing.

REFERENCES

1. World Health Organization. Global status report on road safety 2023. Available from: https://assets.bbhub.io/dotorg/

sites/64/2023/12/WHO-Global-status-report-on-road-safety-2023.pdf
2. Chen SY, Garcia I, Ourshalimian S, Lowery C, Chaudhari PP, Spurrier RG. Childhood opportunity and appropriate use of child safety restraints in motor vehicle collisions. World J Pediatr Surg. 2024;7(2):e000703.
3. Durbin DR, Hoffman BD, Agran PF, Denny SA, Hirsh M, Johnston B, et al. Child passenger safety. Pediatrics. 2018;142(5):e2018246.
4. Rok Simon M, Korosec A, Bilban M. The influence of parental education and other socio-economic factors on child car seat use. Zdr Varst. 2017;56(1):55-64.
5. Li Y, Zhao T, Kang N, Wang W, Liu Q, Namgung M. Analysis of the factors influencing parents' support for child safety seat legislation in Nanjing. Traffic Inj Prev. 2022;23(4):187-92.
6. Armouti I. Factors affecting the use of Child Car Seats for nursery school travel. A study in Athens. In: Transportation Research Board 95th Annual Meeting 2016.
7. Termworasin P, Lumbiganon D, Prueksapraopong C. Car Seat Knowledge and Car Seat Use among Parents of Preschool Children in Bangkok, Thailand. Vajira Med J. 2021;65(2):95-106.
8. Kim SH, Park SW, Lee YK, Ko SY, Shin SM. Use of child safety seats during transportation of newborns. Korean J Pediatr. 2018;61(8):253-7.
9. AlSallum GA, Alwassel AA, Alshushan AM, Abaalkhail AK, Alhasoon MA, Aldamigh AS. Parent's knowledge, attitude, and practice about children car seats at Unaizah city, KSA. J Family Med Prim Care. 2019;8(3):805-11.
10. Jones AT, Hoffman BD, Gallardo AR, Gilbert TA, Carlson KF. Rear-facing car safety seat use for children 18 months of age: prevalence and determinants. J Pediatr. 2017;189:189-195.e9.
11. Dissanayake S, Amarasingha N. Restraint usage characteristics and other factors associated with safety of children involved in motor vehicle crashes. J Civil Eng Archit. 2016;10(1):81-95.
12. Bangkok Media and Broadcasting [Internet]. Recommendations for choosing a "Car Seat" for children to reduce "injury and death" from accidents; 2021 [cited 2024 Jun 7]. Available from: https://www.pptvhd36.com/automotive/news/172026
13. Kannika Pusara. Road Traffic Act (No. 13), B.E. 2565, and the Requirement for Children to Sit in Car Seats. Senate Journal [Internet]. November 2022 [cited 2024 Jun 7]. Available from: https://www.senate.go.th/assets/portals/93/fileups/253/files/Analysis/65/11_66_1.pdf
14. A Situation Study Report: Car Seat in Thailand. Report No: 296-2015-16. [Internet]. 2015 [cited 2024 June 6]. Available from: http://kb.hsri.or.th/dspace/handle/11228/4326?locale-attribute-th
15. Wannapaschaiyong P, Penphattarakul A, Rojmahamongkol P, Sutchritpongsa S. The Relationship Between Primary Caregivers' Psychosocial Factors and Self Esteem in Children and Adolescents with ADHD: An Exploratory Crossectional Study. Siriraj Med J. 2023;75(8):584-91.
16. Sauber-Schatz EK, Ederer DJ, Dellinger AM. Vital Signs: Motor Vehicle Injury Prevention - United States and 19 Comparison Nations. MMWR Morb Mortal Wkly Rep. 2016;65(26):672-7.
17. Lee G, Pope CN, Nwosu A, McKenzie LB, Zhu M. Child passenger fatality: Child restraint system usage and contributing factors among the youngest passengers from 2011 to 2015. J Safety Res. 2019;70:33-8.
18. Sayed I, Abdelgawad H, Said D. Studying driving behavior and risk perception: a road safety perspective in Egypt. J Eng Appl Sci. 2022;69(22).