

# Analysis of the usage and awareness of child safety seats for children aged 0-6 in Leshan City, Sichuan Province, China

Song Li<sup>#</sup>, Qiong Wei<sup>#</sup>, Rui Rao, Zhixin Li, Zhili Lu, Sisi Chen, Li Wang

Department of Paediatrics, The People's Hospital of Leshan, Leshan City, Sichuan Province, China  
<sup>#</sup> Song Li and Qiong Wei contributed equally to this work.

## ABSTRACT

**Objective:** To investigate the current situation of child safety seat use and children's cognition of safe riding in Leshan City, and to provide a basis for the promotion and application of child safety seats in Leshan City. **Methods:** From November 2021 to February 2022, a total of 500 car-owning families who visited or were hospitalized in the department of pediatrics of our hospital were surveyed by self-filling questionnaire method. Through the investigation of personal situation, family situation, travel habits, use of child safety seat, cognition of safe riding, etc., the influencing factors of possession and use of child safety seat and cognition were analyzed. **Results:** The ownership rate of car seats was 57.8%, the use rate was 47.6%, and the always use rate was 18.8% among all families with children surveyed. There were no statistically significant differences in the use rate and always use rate of child safety seats among different genders of children, parents' education background, and car ownership price. The use rate and constant use rate of child safety seats in urban households were significantly higher than those in rural areas. When the main driver was the mother, the use rate of child safety seats was higher, and the difference was statistically significant. From the perspective of cognition, the use rate and constant use rate of the child safety seat of parents with correct cognition were 64.5% and 25.7% respectively, while the use rate and constant use rate of the child safety seat of parents with incorrect cognition were only 11.1% and 4.3%, which were significantly lower than those with correct cognition, and the difference was statistically significant. In terms of cognition, 10.4% of parents think it is safe for children to sit in the back seat with adults in their arms, and 9.0% of family members think it is safe for children to sit in the back seat with seat belts alone. **Conclusions:** At present, the ownership rate, utilization rate, and parents' correct cognition of child safety seats in Leshan City are all at a low level, and there is a lack of regional legal guidance, so the safety situation of children in cars is worrying. To effectively improve the use of child safety seats, the promotion of child safety seats should be promoted from three aspects: improving parents' cognition, forming good traffic habits, and legal guidance.

**Keywords:** Child safety seat, cognition, safe ride for children, safety awareness

## Introduction

Since 2009, China's automobile production and sales have consistently ranked first in the world. According to the report

**Address for correspondence:** Mrs. Li Wang,  
The People's Hospital of Leshan, Leshan City, Sichuan Province,  
614000, China.  
E-mail: LiWang2023@yeah.net

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from the Leshan News Network, as of December 2020, the number of motor vehicles in Leshan City's central district was about 180,000.<sup>[1]</sup> Over the past 5 years, the annual growth rate of drivers in Leshan City has been approximately 7.9%, and the annual growth rate of motor vehicles has been about 10.16%.<sup>[1]</sup> Road traffic injuries have become the second leading cause of death for children under the age of 14. According to the World Health Organization, about 95% of child road traffic accident deaths occur in low- and middle-income countries,<sup>[1]</sup>

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and 36% of the fatalities are child passengers in motor vehicles. Proper use of child safety seats is internationally recognized as an effective measure to ensure children's safety while traveling.<sup>[2]</sup> Child safety seats can reduce the risk of infant road traffic accident deaths by 70% and reduce the risk of toddler deaths by 54% to 80%.<sup>[1]</sup> Currently, most developed countries have legislated the mandatory use of child safety seats, with usage rates exceeding 90%.<sup>[3]</sup> Although China is currently the largest automobile consumer market globally, its automobile industry started relatively late, which may have contributed to the lag in promotion, awareness, popularization, legislation, research, and other aspects related to child safety seats. Through literature review, it was found that only eastern developed regions such as Beijing, Shanghai, Shenzhen, and Shantou have conducted relevant research. Mainland cities have a lack of investigation and research on the use of child safety seats. Therefore, this study investigated the current status of the use of child safety seats, influencing factors, and parental awareness levels among children aged 0-6 in Leshan City. The aim is to provide a reference for promoting child passenger safety work in our city and advancing legislation on the mandatory use of child safety seats.

Therefore, this study aims to address the identified gap in the literature by investigating the current status of child safety seat usage, parental awareness levels, and influencing factors among children aged 0-6 in Leshan City. This study seeks to provide essential information for promoting child passenger safety work in the city and advancing legislation on mandatory child safety seat usage. By addressing this research question, this study aims to contribute to the existing knowledge by providing insights into child safety seat usage in a previously underrepresented area of China. Ultimately, this study aims to inform policymakers, parents, and other stakeholders about the importance of child passenger safety and the need to prioritize the promotion of child safety seat usage to reduce the incidence of child road traffic accident deaths.

In this paper, we present a study on the current status of child safety seat usage, parental awareness, and influencing factors among children aged 0-6 in Leshan City. Section 2 provides a literature review of child passenger safety and child safety seat usage in China and around the world. Section 3 describes the methodology used in our study, including data collection and analysis. Section 4 presents our findings on child safety seat usage, parental awareness, and influencing factors. In Section 5, we discuss our results and their implications for promoting child passenger safety in Leshan City. Finally, we conclude with a summary of our study's main findings and recommendations for future research.

## Objects and Methods

### Objects

The survey targeted parents of children aged 0-6 in Leshan City (excluding divorced families) who own at least one private car. A self-administered questionnaire survey method was employed. A total of 500 families with children receiving

outpatient or inpatient care at the pediatrics of our hospital were surveyed from November 2021 to February 2022. This survey has been reviewed and approved by the Ethics Review Committee of Leshan People's Hospital, with reference number PHLS- EC-2019-25.

### Methods

The survey was conducted by trained and qualified investigators using a combination of paper-based self-administered questionnaires and face-to-face interviews through the QuestionStar survey platform. All collected questionnaires were reviewed by investigators for completeness and logical consistency. The questionnaire was developed by the research team based on a literature review and underwent expert review and pre-experimental testing. The survey covered various aspects, including sociodemographic characteristics, knowledge related to child passenger safety and child safety seats, and factors influencing the use of safety seats.

Measures included in the survey were as follows:

1. Sociodemographic characteristics: age, gender, education level, occupation, monthly income, and number of children
2. Knowledge related to child passenger safety and child safety seats: questions regarding laws and regulations, proper installation and use of safety seats, and the risks associated with improper usage.
3. Awareness: questions regarding familiarity with child safety seat brands, the importance of using child safety seats, and the benefits of proper usage.
4. Factors influencing the use of safety seats: questions regarding attitudes towards safety seats, barriers to usage, and sources of information.

A total of 507 questionnaires were distributed, and 500 questionnaires were collected, resulting in a response rate of 98.61%. Questionnaires with missing important information or children weighing more than 36 kg (the upper weight limit for child safety seat usage) were excluded from the analysis. A total of 500 valid questionnaires were included in the analysis, resulting in an effective response rate of 98.61%.

### Observational indicators

The observational indicators include<sup>[4]</sup> ownership rate, usage rate, and always-usage rate of child safety seats. Regarding the frequency of child safety seat usage, the response options include "always," "often," "sometimes," "rarely," and "never." "Always" refers to using the seat for  $\geq 9$  out of 10 average car rides; "often" refers to using the seat for 6-8 out of 10 average car rides; "sometimes" refers to using the seat for 3-5 out of 10 average car rides; "rarely" refers to using the seat for 1-2 out of 10 average car rides; "never" refers to never using the seat.

### Statistical methods

Descriptive statistical analysis and Chi-square tests were performed using SPSS 19.0 software to analyze the usage

and awareness of child safety seats. A significance level of  $P < 0.05$  was used to determine the statistical significance of the differences.

## Results

### Demographic characteristics

Among the 500 valid responses, the proportion of male and female children was 56.0% and 44.0%, respectively. The age groups of children were as follows: 0-1 years old (9.6%), 1-3 years old (29.6%), and 4-6 years old (60.8%). Regarding the highest education level of the parents (considering both parents), 66.8% had a bachelor's or associate degree, while 10% had a master's degree. Among the participants, 75.8% resided in urban areas, and 64.8% of the families had the father as the driver for child transportation. In terms of car ownership, the majority of families (36.8%) had a car cost between 100,000 and 170,000 RMB. Additionally, 21.85% had a car cost below 100,000 RMB, 18.4% had a car cost between 170,000 and 250,000 RMB, and 23.0% had a car cost exceeding 250,000 RMB.

### Ownership and usage of child safety seats

Among all surveyed families with children, the ownership rate of child safety seats was 57.8%, and the overall usage rate was 47.6%. However, only 18.8% of families always used child safety seats when their children traveled. Looking at different age groups, the ownership rate was 41.2% for the 1-3-year-old group, significantly lower than the 0-1-year-old group, and 3-6-year-old group, with statistically significant differences. However, there was no statistically significant difference in the usage rate among different age groups. In terms of the "always usage" rate, the 0-1-year-old group had the highest rate at 33.3%, followed by the 1-3-year-old group at 25.0%, and the 3-6-year-old group at 13.5%, with statistically significant differences [see Table 1].

Among families who did not own child safety seats, 42.2% of them cited reasons such as the child not cooperating (51.2%), space constraints (30.3%), absence of legal enforcement (16.1%), and other reasons (28.4%) [Table 2].

There were no statistically significant differences in the usage and "always usage" rates of child safety seats among different genders of children, parents' highest education level, and car prices. The usage and "always usage" rates of child safety seats among families living in urban areas were significantly higher than those living in rural areas, with statistically significant differences. When the primary driver was the mother, the usage rate of child safety seats was higher at 59.5%, with a statistically significant difference; however, there was no statistically significant difference in the "always usage" rate. From a cognitive perspective, the usage and "always usage" rates of child safety seats were 64.5% and 25.7%, respectively, among parents with correct knowledge, while they were only 11.1% and 4.3%, respectively, among parents with incorrect knowledge, significantly lower than those with correct knowledge, with statistically significant differences [Table 3].

**Table 1: Ownership rate, usage rate, and always usage rate of child safety seats among children of different age groups [n (%)]**

Child age	No. people (%)	Ownership rate (%)	Usage rate (%)	Always usage rate (%)
0-1 years old	48 (9.6)	27 (56.2)	22 (45.8)	16 (33.3)
1-3 years old	148 (29.6)	61 (41.2)	71 (48.0)	37 (25.0)
3-6 years old	304 (60.8)	171 (56.25)	135 (44.4)	41 (13.5)
Total	500	289 (57.8)	238 (47.6)	94 (18.8)
$\chi^2$		9.43	0.51	15.99
$P$		0.00	0.77	0.00

**Table 2: Reasons for not owning a child safety seat [n (%)]**

Reason for not owning*	No. People (%)
Affect car space	64 (30.3)
No legal enforcement	34 (16.1)
Children do not cooperate	108 (51.2)
Other reasons	60 (28.4%)

\*Multiple-choice questions. The total percentage may exceed 100% because the proportions of each option are calculated based on the total number of responses

Among children 1-3 years, 61 families owned a car seat but 71 reported using one. There could be several reasons for this discrepancy. First, it is possible that some families borrowed or rented car seats from friends, relatives, or car rental agencies, even though they did not own one themselves. This could explain why the number of users exceeds the number of owners. Additionally, some parents may have access to car seats through other means such as community programs, daycare centers, or public transportation services that provide car seats for use during specific activities or transportation. Furthermore, it is worth noting that the survey captured data based on self-reporting from parents. It is possible that some parents who reported using a car seat may have misunderstood the question or misreported their usage. Alternatively, some parents may have used a car seat for certain trips but not consistently, leading to a discrepancy between ownership and usage rates. To gain a better understanding of this phenomenon, future research could explore these factors in more detail by including questions on borrowing or renting car seats, as well as examining the consistency of car seat usage across different types of trips (e.g., short vs. long distances, routine vs. occasional trips).

### Child passenger safety awareness

In the survey on child passenger safety awareness, this study included three safety knowledge points, all of which were multiple-choice questions:

- Which of the following is a safe way for children to ride in a vehicle?
  - Adults holding the child in the front passenger seat.
  - Children sitting alone in the front passenger seat and wearing a seat belt.
  - Children sitting alone in a rear seat installed with a child safety seat.

**Table 3: Usage Rate and “Always” usage rate of child safety seats in families with different characteristics [n (%)]**

Characteristic	No. People (%)	Usage Rate (%)	Always Usage Rate (%)
Gender		238	94
Male	281 (56.0)	140 (49.8)	51 (18.1)
Female	219 (44.0)	98 (44.7)	43 (19.6)
$\chi^2$		1.27	0.18
<i>P</i>		0.26	0.67
Residence			
Urban	379 (75.8)	193 (51.0)	81 (21.0)
Rural	121 (24.2)	45 (37.2)	13 (10.7)
$\chi^2$		6.93	6.78
<i>P</i>		0.00	0.00
Parents' highest education			
Junior high school or below	38 (7.6)	14 (36.8)	6 (15.8)
High school or technical secondary school	78 (15.6)	34 (43.5)	7 (8.9)
Undergraduate or college	334 (66.8)	163 (48.8)	70 (21.0)
Master's degree and above	50 (10.0)	27 (54.0)	11 (22.0)
$\chi^2$		2.38	6.51
<i>P</i>		0.49	0.08
Car price			
<100,000 RMB	109 (21.8)	49 (44.9)	18 (16.5)
100,000-170,000 RMB	184 (36.8)	86 (46.7)	32 (17.4)
170,000-250,000 RMB	92 (18.4)	44 (47.8)	18 (19.6)
250,000-350,000 RMB	69 (13.8)	39 (56.5)	16 (23.2)
>350,000 RMB	46 (9.2)	20 (43.4)	10 (21.7)
$\chi^2$		8.79	1.78
<i>P</i>		0.07	0.78
Main driver			
Father	324 (64.8)	138 (42.3)	54 (16.7)
Mother	84 (16.8)	50 (59.5)	17 (20.2)
Others	92 (18.4)	50 (54.3)	23 (25.0)
$\chi^2$		9.73	3.40
<i>P</i>		0.00	0.18
Parents' awareness of children's safe rides			
Cognitive correct*	338 (67.6)	218 (64.5%)	87 (25.7)
Cognitive error	162 (32.4)	20 (11.1%)	7 (4.3)
$\chi^2$		119.41	32.91
<i>P</i>		0.00	0.00

\*Correct parental understanding of child passenger safety refers to the recognition that the safest way for children to travel in a vehicle is by occupying a child safety seat installed in the rear seating position

- (4) Adults holding the child in the rear seat.
  - (5) Children sitting alone in the rear seat and wearing a seat belt.
2. Can carrying a child while riding effectively protect the child in the event of a collision?
  3. What is the correct installation position for a child safety seat?

From the responses obtained, it was found that 77.60% of parents were aware that children riding alone in the rear seat using a child safety seat was a safe method. 80.8% of parents knew that carrying a child during a collision does not effectively protect the child. 96.8% of parents were aware of the correct installation position for a child safety seat. Among them, 68.85% correctly answered all three knowledge points, while 2% answered all questions incorrectly. Additionally, 10.4% of parents believed that adults holding the child in the rear seat was a safe way for children to travel, and 9.0% believed that children sitting

alone and wearing a seat belt in the rear seat was safe. Refer to Tables 4 and 5 for more details.

## Discussion

Child safety seats are devices designed to ensure the safety of infants and children during car rides, effectively safeguarding their security.<sup>[5]</sup> In this study, the overall adoption rate and frequent usage rate of child safety seats for 0-6-year-old children were 47.7%, which is lower than the investigation level of 53.45% in a Shanghai community in 2018,<sup>[6]</sup> and far below the adoption rates in developed countries (>90%).<sup>[2]</sup> In this study, the frequent usage rate of child safety seats for 0-1-year-old group was the highest at 33.3%, indicating that parents may be more inclined to use safety seats during the infancy stage and overlook the safety of older children or give up due to decreased compatibility as children grow older. At the same time, the lack of child safety seats in households was mainly due to parents' beliefs that



children would not cooperate, concerns about car space, and the absence of legal enforcement. Developed countries have already enacted legislation mandating the use of child safety seats. In China, according to investigations, there are 18,500 children under the age of 14 dying every year due to traffic accidents, with a death rate two and a half times that of Europe and 2.6 times that of the United States. Currently, only Shanghai, Shandong, Shenzhen, Tianjin, Chongqing, and other places have issued related local laws, and a nationwide law on child safety seats is urgently needed.<sup>[7]</sup>

This study showed that child safety seat usage and frequent usage rates in urban families were significantly higher than those in rural families, indicating that the safety of children’s car rides in rural areas is more concerning. When the primary driver is the mother, the child safety seat usage rate is significantly higher than when the primary driver is the father, suggesting that mothers are more cautious when it comes to ensuring the safety of their children’s car rides. Furthermore, when parents have correct knowledge about safe child transport, the usage and frequent usage rates of child safety seats were 64.5% and 24.7%, respectively, compared to 11.1% and 4.3% in opposite cases, indicating that parents’ awareness greatly influences child safety seat usage.

Regarding the investigation into awareness regarding child transport safety, 68.8% of parents answered all three safety knowledge questions correctly, while 2% of parents answered all three questions wrong. There are also significant misunderstandings about child transport safety. In this study, 10.4% of parents believed that “having adults hold children in the backseat” is a safe way for children to ride in a car. In fact, under this type of transportation, during a collision, the child will be sandwiched between the adult and the car, acting as an airbag, neither protecting the child nor increasing the child’s chances of injury. According to research, when a car is traveling at 48 km/h and experiences a collision, a baby weighing 7 kg will generate an inertia impact force of up to 275 kg when thrown forward.<sup>[5]</sup> This force will make it impossible for an adult to hold onto the child,

and the faster the speed or the heavier the weight of the child, the greater the impact force. In this study, 9% of parents believed that “children wearing seat belts in the backseat” was a safe way for children to ride in a car. According to research by Jones MLH *et al.*, the anterior superior iliac spine of adults protrudes significantly, making it a reliable point for securing seat belts. However, the anterior superior iliac spine of children is not yet fully developed before the age of 10, and these anatomical characteristics make it difficult for seat belts to be correctly positioned and secured.<sup>[8]</sup> Additionally, research shows that using adult seat belts prematurely increases the risk of visceral and spinal cord injuries, also known as the “seat belt syndrome”.<sup>[9]</sup> Therefore, it is essential to promote knowledge about child transport safety.

The findings from the study highlight several important issues related to child safety seat adoption and usage. First, the overall adoption rate and frequent usage rate of child safety seats for children aged 0-6 are relatively low compared to both previous investigations in Shanghai and the adoption rates in developed countries. This indicates a need for increased efforts to promote and encourage the use of child safety seats in China. Furthermore, the study revealed that child safety seat usage and frequent usage rates are significantly higher in urban families compared to rural families. This suggests that there is a greater concern for the safety of children’s car rides in rural areas. Additionally, when the primary driver is the mother, the child safety seat usage rate is significantly higher than when the primary driver is the father, implying that mothers may be more cautious about ensuring their children’s safety during car rides. Importantly, the study also found that parents’ awareness and knowledge about safe child transport significantly influence the usage of child safety seats. Parents who have correct knowledge about child transport safety are more likely to use child safety seats frequently. However, there are still significant misunderstandings among parents, such as believing that having adults hold children in the backseat or using adult seat belts for children are safe practices. It is crucial to promote accurate knowledge about child transport safety to address these misconceptions and ensure the proper use of child safety seats.

In conclusion, the study highlights the need for increased adoption of child safety seats in households with young children in Leshan City and the importance of raising awareness among parents regarding child transport safety. It also emphasizes the necessity of implementing nationwide legislation on child safety seats in China to further improve child safety during car rides. By addressing these issues, we can ensure the well-being and security of children while traveling on the roads.

**Table 4: Cognition status of children’s car safety knowledge [n (%)]**

Answer	Respondents	Percentage
Question 1 is correct	388	77.6
Question 2 is correct	404	80.8
Question 3 is correct	484	96.8
All correct	344	68.8
All fault	10	2.0

**Table 5: Parents’ opinion of children’s safe riding methods [n (%)]**

Way of Traveling	Respondents	Percentage
An adult holding a child sitting in the front passenger seat.	7	1.4
A child sitting alone in the front passenger seat and wearing a seat belt.	8	1.6
A child sitting alone in the rear seat in a properly installed child safety seat	388	77.6
An adult holding a child while sitting in the rear seat.	52	10.4
Children wearing seat belts alone in the rear seat.	45	9.0

## Conclusion

This study shows that the adoption rate and usage rate of child safety seats in households with children aged 0-6 in Leshan City are at low levels, not only below the levels of first-tier cities in China but also far below those of developed countries. Similarly, parents have significant misconceptions about child transport safety, and the lack of relevant legislation and guidance further complicates the situation, making child transport safety concerning. Promoting child safety seats should involve efforts to raise awareness among parents, improve legislation, and encourage enforcement to effectively guarantee the safety of child transport. This study provides a preliminary understanding of the adoption rates and parents' awareness of child transport safety in Leshan City and serves as a reference for future efforts to promote child transport safety and child safety seat utilization. However, mandatory legislation regarding the use of child safety seats is the most effective way to increase adoption rates, and we recommend improving relevant laws on child safety seats and strict law enforcement to protect the safety of children during transport.

The limitations of this study include its focus on only one city in China, reliance on self-reported data from parents that may be subject to social desirability bias, lack of consideration of economic factors that may impact the adoption and usage of child safety seats, limited exploration of reasons why parents with correct knowledge do not use them frequently, and lack of investigation into children's perceptions of child safety seats. These limitations suggest the need for further research to understand the broader factors impacting the adoption and usage of child safety seats in China.

## Ethics approval

This survey has been reviewed and approved by the Ethics Review Committee of Leshan People's Hospital, with reference number PHLS- EC-2019-25.

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## Conflicts of interest

There are no conflicts of interest.

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