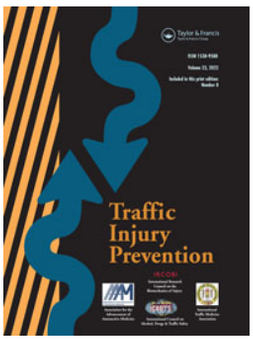

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Child safety restraint patterns in Moldova

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ABSTRACT

Objective: The Republic of Moldova has one of the European region's highest road traffic injury rates and also has an increase in motorization and exposure of children as vehicle passengers. This study describes child restraint use, and parents' knowledge and attitudes toward child restraint based on observations in Chisinau, the country's capital and largest city. The study aims to describe the use of child restraints and to compare data with existing standards of good practice.

Methods: An observational study on child safety restraint use was conducted in 2018. Observational sites included 22 early education institutions, where drivers (n = 611) and child passengers (n = 710) were observed. Observations were conducted as motor vehicles parked or pulled to a stop near the early education institutions and included a driver survey on knowledge and attitudes toward restraint legislation and child safety behavior.

Results: Of the 710 child passengers observed, 462 (65.1%) were appropriately restrained, 145 (20.4%) were seated in restraints inappropriate for the child and 103 (14.5%) of children were unrestrained. Younger children (0-3 year-old) were 7 times more likely to be properly restrained compared with children with ages between 4 and 6 (OR 1.92, 95% CI 1.15 to 3.22). Two-thirds out of 609 observed drivers with full study data, N = 431 (70,8%), knew about the mandatory legislation on using child safety restraints in the Republic of Moldova. The drivers using child safety restraints responded that they used them because of their safety features, and the major reason for nonuse was high price/affordability.

Conclusion: This study, the first to document child safety restraint use among children, indicates that much progress has been made, in that the majority of children are restrained and most drivers of children are aware of safety policies. However, progress can be made to increase knowledge and motivation to safely transport children, and to ensure safety seats are affordable and available. These data will be an important foundation on which to advocate for increased safety activities, child restraint policies, educational approaches in Moldova and to monitor progress over time.

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Introduction

Road traffic injuries are the eighth leading cause of death worldwide, with disproportionately high mortality rates in low- and middle-income countries (WHO 2016, James et al. 2020, Murray et al. 2020). Children are among the most vulnerable of road users, and, globally, road traffic injuries are currently the leading cause of death for children and young adults aged 5 – 29 (WHO Geneva 2018). With increased motorization throughout the world, but with particularly high motorization increases in LMICs, children are spending a larger proportion of their time traveling in cars. The World Health Organization includes child restraint laws as one of the five key indicators for road safety policy. Currently, only 33 (18.8%) of 175 countries tracked have best-practice child restraint laws – with only a 14% increase from 2014 to 2017 (WHO Geneva 2018). According to a study on the analysis of the legal coverage of child restraints over 40 years, it is mentioned that 2 global factors (WHO and World Bank's road safety global campaign after 2004 and United Nations 1958 Vehicle Agreement) and 2 national factors (gross domestic product per capita and the existence of road safety agencies) are significantly associated with the adoption of this measure and positively associated with child restraint laws adoption (Nazif-Muñoz 2015).

According to the World Report on Child Injury Prevention (Peden et al. 2008), child passengers in motor vehicle crashes account for approximately 50% of transport-related injuries in high-income countries. While this proportion is smaller in lower-income countries, it is likely to

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increase in the many countries experiencing increased motorization. Studies show that the most effective way to reduce the risk of injury in a motor vehicle crash is to restrain the occupant in the vehicle (Ma et al. 2012), and one of the most effective ways of increasing child occupant restraint is through policy (Nazif-Munoz and Nikolic 2018). Evidence on contributions of safety policy can serve as a strong incentive to support the implementation of such laws.

The Republic of Moldova is a LMIC in Eastern Europe. It is one of Europe's smallest and poorest countries, it is experiencing significant economic growth and policy reform (World Bank 2019). With this progress has come rapid motorization, increasing from 70 vehicles per 1,000 people in 2002 to 454 per 1,000 people in 2018 (WHO Geneva 2018), although still lower than the 602 per 1,000 average for EU countries. Influence from the European Union has led to improved road safety regulations, and Moldova implemented a national child safety restraints law in 2013. However, the law does not include age-specific restraints or requirements that child safety seats should meet specific standards (WHO Geneva 2018). Enforcement scores range from a 2 to an 8 on a ten-point scale, with ten being optimal enforcement. According to the road traffic regulation approved by Government Decision no. 357 of 13.05.2009 obliges all drivers who have children up to 12 years of age as passengers to be provided with a "restraint system" or "means of adaptation" (special cushion, lift seat, which allows the application of standard seat belts). The same regulation established that restraint choice considers the child's height and weight but does not provide specific requirements and states that when purchasing a car seat, it is necessary to check that it meets the safety highest safety standards. Consumers have little access to this information. With opportunities to improve compliance and enforcement, prevalence of child restraint uses and reasons for nonuse must be understood.

There are no specific data available, reported, or other research so far in the country, no database that generates suggestive data which would allow to evaluate the rate of safety devices use, only regular information campaigns are carried out for preventive purpose. The aim of the study is to describe the use of child restraints in the Republic of Moldova and to compare data with existing standards of good practice. Such specific study on child safety restraints use have not been conducted in the country before.

Material and methods

Study design and participants

An observational study on the use of child safety restraints and seat belts accompanied by a driver survey was conducted in Chisinau, Republic of Moldova. The methodology used in this research was successfully developed and implemented by the University of Iowa Injury Prevention Research Center for the Iowa Child Occupant Survey, in Shantou, China (Chen et al. 2014) and in Cluj-Napoca, Romania (Rus et al. 2015). According to the 2014 census, Chisinau has a population of 662,836 people, out of which children aged 0-19 represent 21.6%. The study was conducted from September to December 2018 and is the first observational study on passenger safety in motor vehicles in the country. Observational sites were selected by listing the potential sites, and then selecting them based on a randomly-generated number list. The sites were representative geographically (by 4 institutions per sector and additional 2 more for the central sector as it is the largest one, thus the higher number of educational institutions) to the number of existing institutions in those 5 sectors of the city. Therefore, 22 early education institutions, which represent 13.6% of the 162 early education institutions in the city where included in the study. We included information about all children in the vehicle, who accept to participate in the study. Observations and data collection was performed in the morning (7.00 to 10.00) and late in the afternoon (16.00 to 19.00) to correspond with the window of time in which children are dropped off and picked up from these institutions. Ten observers were trained on data collection in understanding the observational variables and different types of child occupant restraints and the correct installation for each type of car safety restraint use for the observed age-group.

Study protocol

Data were collected by observing all occupants of the motor vehicle and by applying a short survey for drivers. Eligible for participation in both the observation and the survey were people with their motor vehicles parked near the early education institutions and who had at least one child in the motor vehicle aged between 2 to 7 years who attends kindergarten, as well as all children up to 12 years old present in the vehicle. Observers approached the parked vehicles and identified if a child was present. The observers asked the driver if he/she was available to participate in a short survey and his/her willingness to respond was considered as the consent to participate in the study, including both the child safety seat use observation and the survey. The study included drivers with children in the car who were in the parking area of the selected institutions. The observations were made only once, during the same day. No personally identifiable information was collected for the study. This study was approved by the Ethics Committee of "Nicolae Testemitanu" State University of Medicine and Pharmacy. While in some cases a vehicle may have parked in the drop-off area while researchers were busy with other participants, this was not common. We were not able to track instances of vehicles not approached for participation. Participants or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

Data collection process

The study instruments included an observation checklist and a survey for drivers, properly translated from English into Romanian for a prior study in Cluj-Napoca, Romania (Rus et al. 2015, Dulf et al. 2020). The observation checklist included 7 questions regarding the time and location of the observations, type of car, driver's sex, and use of seat belt by

the driver; for each child occupant, collected data refers to the child's position in the car, safety restraint used by the child, type of restraint and orientation of the safety restraint used. The driver's survey included 15 questions related to each child occupant's age, sex, weight, and height; driver's provided information on their gender, relationship to the children, their level of education, knowledge and attitudes concerning safety seat use and national road traffic regulations. The proper restraint was defined as using a type of restraint (child seat, booster seat with and/or without backrest or seat belt) appropriate for their age and height based on the CDC criteria. The CDC criteria for the use of car seats, booster seats, and seat belts based on child characteristics are reflected in totally in the regulation of road traffic in the Republic of Moldova: children under 12 years old can only be transported in cars equipped with a restraint system, also the weight and height of the child (not only the age) are considered. National local regulation stipulates 4 groups of restraint system: a rear-facing restraint system for infants and toddlers ($\cong$ ages 0-15months) around $\leq$ under 13 kg in weight; a restraint system adjusted to the height and weight of 9-18kg in weight for $\approx$ 1-4 years old (thus, all children under 4 years old using a child safety seat were considered properly restrained); a booster with backrest for 15-25 kg in weight and until the child exceeds the height of 145 cm, for $\approx$ 3,5-7 years' old and raising pillow or booster without backrest $\geq$ 22-36 kg in weight. Based on the driver's report of the child's age, weight and height, we assessed if the child was appropriately restrained. Children who were using any type of restraints, but did not respect the CDC criteria, were considered improperly secured.

Statistical analysis

Observations and survey data were collected by hand on prepared data sheets and entered into an Excel database. Data were double entered for validation at the level of 95% accuracy. Differences of observations between sites were examined to identify if systematic differences were found based on location, and no significant differences were found. We examined trends at each location to examine site-specific differences, and we did not find any differences within age and gender groups. This indicates that there were no systematic differences in data collection, based on the site similarities and the data entry validation. Univariate distributions were used to examine driver and child characteristics. The odds of appropriately restrained, compared with improperly secured, were calculated using logistic regression. The independent variables included driver sex, driver seat belt use, driver education level, and driver knowledge/attitudes about child seat use. Logistic regression was run in R to identify factors that predicted child safety seat use. Variables were chosen based on a priori expectation that the variable was related to child seat use and when the unadjusted odds ratio was significant. Final variables in the model included driver gender, the relationship of the driver to the child, driver seat belt, driver awareness of safety seat legislation, child age, and child gender.

Results

A total of 647 motor vehicles were approached, 611 drivers agreed to participate out of which 609 had full data completed, and 710 children were observed (in some vehicles there was more than one child), 36 drivers (5.6%) refused to participate.

Out of the total number of observed drivers, 486 (79,7%) wore their seat belts, while 607 (85,5%) children wore a safety restraint (Table A1). Among all children observed, 454 (63,9%) were in a child safety seat, 52 (7,3%) were in a booster seat, and 101 (14.2%) were secured by seat belts. Of the children placed in a child safety seat, 54,7% were oriented in a forward-facing position and 45,3% were oriented in a rear-facing position. Nearly all children (86.3%) were in the back seat of the car (Table A1).

The proportion of children who were using child safety restraints were different by age groups (Table A2). Infants and toddlers had higher rates of restraints, 88,9%, while preschool children and primary school children had lower rates, 84,2% and 84%, respectively. The proportion of children who were appropriately restrained was higher in the age group 0-3 (n = 159; 79,9%), followed by the age group 4-6 (n = 274; 59.5%). Improperly secured children were mostly in the age group 7-12 (n = 34; 68.0%). Compared with unrestrained children, children age group 0-3 were seven times more likely to be properly restrained compared with children age group 4-6 (OR 1.92, 95% CI 1.15 to 3.22).

Two-thirds of those 609 drivers with full survey data (n = 431, 70,8%) knew about the existence of legislation on using the child safety restraints. When the parents were asked about travel safety of a child under 12 years old in the parents' arms, most of the parents (n = 334, 54,7%) responded that such transport is not safe, and 176 (28,8%) mentioned that it is safe. Asked about what age children should ride in a car seat, 33.9% responded that children should be in a car seat up to the age of 6, 29.6% responded up to the age of 12 and 12.9% responded up to the age of 3, with 13.1% reporting that they did not know. The same question was asked about booster seats. One-third of the parents (n = 181, 29.9%) indicated that they do not know the legal age up to which booster seats should be used, while another third (n = 171, 27.9%) indicated that children up to the age of 12 should ride in a booster seat (Table A3).

When parents were asked about the age at which a child should be allowed to travel in the front seat of the car, most parents (n = 207, 33,9%) mentioned the age of 6, 181 (29,6%) of parents considered the appropriate age to be 12, 79 (12,9%) the age of 3, and 72 (11,8%) did not know at what age. Being asked until what age a child must be transported using a child safety seat, 27,9% responded that children must be transported in a child safety seat until the age of 12, 23,2% responded until the age of 6, and 12,9% responded until the age of 3 (Table A3).

Driver and child factors were related to child safety seat use (Table A4). Female drivers had 1,48 (95% CI = 1,11–1,85) higher odds of driving with a child in a safety seat compared with male drivers. When the driver was wearing a seat belt, the odds of the child being in a safety seat

were 1,73 times higher (95% CI = 1,20–3,14). When the driver was aware of the legislation, the odds of the child being in a safety seat was 1,84 (95% CI = 1,25–2,89) higher than if the driver was not aware. Younger children were more likely to be in child safety seats, with about a 25% increased odds (95% CI = 0.63 − 0.85) with each increasing year of age. Child gender was not related to safety seat use.

The drivers using child safety restraints responded that they used it because of their safety features (n = 355, 58,1%) and because it is a requirement imposed by law (n = 47, 7,7%), (Table A5). Those who mentioned that they do not use any child safety restraints identified financial barriers (n = 62, 37,7%), followed by lack of time to install the restraint (n = 11, 6,7%), or because the child safety seat is in another car or is uncomfortable for the child (n = 7, 4,3%). When asked about reasons that would influence them to use a child safety restraint, the drivers responded that free availability (n = 35, 24,3%), development and application of a more specific law (n = 21, 14,6%), or with a combination of these two reasons (n = 62, 43,1%), (Table A5).

Discussion

This study is the first observational study on child passenger safety in motor vehicles in the Republic of Moldova, and its purpose was to fill existing gaps in the literature regarding parents' knowledge and attitudes when it comes to child safety restraints, as well as assessing through an observational study the usage of safety seats. The results show that nearly 80% of the drivers were wearing a seatbelt, whilst more than 85% of children were using some type of restraint when observed. A similar study in Romania conducted several years earlier, (Rus et al. 2015) found that 67.4% of children were restrained. The majority of children were seated in the back of the car (86.3%), which indicates that knowledge about child occupant safety is reached. These results indicate that the majority of the sampled population are restrained, but more progress can be made to fill gaps among those choosing not to use restraints as drivers or for their children. Similar to another study in China, even though most drivers had positive attitudes about the use of a child restraint system, their level of usage was very low. Given the results of the present study, these comparisons can help us to deduce that a large number of road injuries among children may be due to misuse as well as nonuse of child safety devices (Chen et al. 2014, Rus et al. 2015, Whyte et al. 2020).

The most common barriers reported by drivers in this study to child safety seat use were reported to be their high prices, the car installation procedure which is time-consuming, the fact that the child safety seat is uncomfortable, and comfort with relying on the existence of the seatbelt in the car (the one designed for older children, adolescents and adults). These barriers have been reported in many studies, and may be a reason that more than a third of children end up not wearing a child safety restraint in many countries with stronger policies than Moldova. Even in the cases in which a child safety restraint was used, studies have found that many were traveling forward-facing, thus violating recommendations that children are safer when rear-facing (Simpson et al. 2003, Rus et al. 2015). These results indicate that community safety campaigns may be critical activities to accompany policies that require child safety seat use and programs that help make devices available.

A Canadian study, which represents a country with a long-standing child safety seat law (Bruce et al. 2015), found that 99.6% of children were restrained, 91% were in the correct seat, and 48% of restraints were correctly installed. Findings from countries with well-established safety policies and safety cultures provide goals for emerging countries such as Moldova. Improper use of child occupant restraint is a problem even in high-income countries such as Norway, where according to a study (Naess et al. 2013) found that only 24% of children observed were using a safety seat, and the authors concluded that the remaining children were in positions that would not reduce trauma in a crash. Whyte et al. 2020, found in their study that 20% of children were unrestrained and 31% were using a restraint that was either inappropriate for their age or not used correctly.

Reviewing, improving and enforcing existing legislation could be of significant value in maintaining road safety among vulnerable groups, such as children. Our study, highlights the need to revise the legislation in force, as well as develop specific methods of reaching target groups knowledge and attitudes. This comes up from the fact that the Swedish child road study (National Society for Road Safety 2018), which showed that the legal implementation of the recommendations on safety devices reduced the number of injuries, and the correctness of their use must be explained and verified. The Romanian study (Rus et al. 2015, Dulf et al. 2020) also highlights that traffic safety legislation should be improved, and clear regulations on when to switch from one restraint to another over time should be included in the legislation.

The child restraint and seat belt legislation in reducing child injuries applied in Serbia showed effective results in reducing injuries among children aged 0-3 in the short term and injuries among children aged 4-12 in both the short term and long term (Nazif-Munoz and Nikolic 2018). Child safety seat legislation has an impact on restraint use in Canada (Simniceanu et al. 2014); although, injury prevention strategies, including additional surveillance, interventions, and the use of child restraint systems, are important to reduce vehicle-related injuries and deaths. The authors of another study in Canada identified a greater impact on the use of seat belts with the introduction of the law on the use of seat belts; even more than about 17% of the observations of the study of vehicle occupant deaths is attributable to the adoption of mandatory seat belt legislation and the increase in the corresponding rate of seat belt use (Sen and Mizzen 2007).

The Republic of Moldova would benefit from more thorough and effective legislation to maximize benefit in injury reduction as learned from the best-practice child restraint laws that already exist globally. Ongoing monitoring of pediatric road injury and safety equipment use can support improvements and measure their impact. Such achievements

will require multi-sector coordination, such as existing support from the police, who have data surveillance capability that is essential for ongoing monitoring (Cazacu-Stratu et al. 2019, Cociu 2020).

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Disclosure statement

The authors do not have any financial interests or benefits to declare.

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Data availability statement

The data that support the findings of this study are available from the corresponding author (SC), upon reasonable request.

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