

Determinants of Road Traffic Accident Among Elderly in Malaysia: A Scoping Review

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ABSTRACT

Malaysia is transitioning into an aged nation, with 15% of its population projected to be 60 years or older by 2030. This demographic shift is expected to increase the number of elderly road users, yet road conditions remain inadequate for their needs, and preventive measures for road traffic accidents (RTAs) are still underdeveloped. There is limited understanding of how physiological, cognitive, and environmental factors contribute to RTAs among the elderly in Malaysia. This scoping review aims to explore existing literature on the factors influencing RTAs in this demographic. The review follows the PRISMA-ScR reporting guidelines and includes peer-reviewed studies published in English from 2012 to 2022. A total of 15 studies were identified, and the findings are categorized into four domains: medical conditions, physical capability, driving nature, and environmental factors. Key determinants include cognitive impairment, medical illnesses, visual impairment, depression, and adverse medication effects (medical conditions); poor physical strength and flexibility, and fatigability (physical capability); long driving hours or distance, driving alone, and poor ergonomics (driving nature); and poor road condition and visibility, road complexity, reckless behaviour of other road users, and poorly maintained or old vehicles (environmental factors). These determinants are crucial in informing RTAs prevention strategies and guiding public health interventions for the elderly. However, the limited number of studies highlights the need for further research in this area to better support the safety of elderly road users.

Keywords

Determinants, road traffic accident, elderly, Malaysia

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INTRODUCTION

Malaysia is undergoing a demographic shift toward an aging society, with individuals aged 60 and above classified as elderly by the United Nations—now comprising more than 7% of the total population.¹ According to the National Health Policy for Older Persons, the country is projected to attain the status of an aged nation by 2030, when 15% of the population will be 60 years or older.² This demographic trend has led to an increase in elderly road users, who participate in various modes of transportation, such as walking, cycling, riding motorcycles, and driving. Among these, driving remains the preferred mode of transport for the elderly due to its convenience and the limited availability of public transportation.^{3,4} Elderly individuals often drive to fulfil essential daily needs such as grocery shopping, healthcare appointments, and social activities.⁵

The incidence of road traffic accidents (RTAs) in Malaysia has steadily risen by 5% annually, with 598,635 RTAs recorded in 2024.⁶ Data from the Ministry of Transport (2018) highlights that drivers aged 50 and above contribute to 32% of RTAs in the country. Although elderly drivers often have extensive driving experience, age-related declines in physical and cognitive abilities can impair their driving performance, making them more vulnerable to accidents. Factors such as slower reaction times, diminished vision, and challenges in navigating complex traffic conditions—narrow roads, sharp turns, heavy traffic, and adverse weather—heighten the risk for elderly drivers.⁷ Furthermore, rapid urbanization and inadequate infrastructure planning increase the dangers for elderly pedestrians, exacerbating their susceptibility to road accidents in Malaysia's changing urban landscape.⁸

Amid this rising concern, the safety of elderly road users has become a topic of national debate. Critics argue that elderly drivers pose significant risks due to their declining ability to respond quickly to hazardous situations, potentially endangering both themselves and other road users.⁹ On the other hand, many advocate for solutions that allow elderly individuals to remain active and independent, emphasizing their right to mobility.¹⁰ Proposals such as periodic medical and cognitive assessments during license renewals have been suggested to ensure that elderly drivers remain fit to drive. However, these measures are still under discussion, and no formal policies have been implemented, reflecting the ongoing debate about balancing road safety with the independence of elderly road users in Malaysia.

Although some countries have implemented specific regulations for elderly drivers, Malaysia's current measures to mitigate RTAs among this demographic remain inadequate. Elderly individuals involved in RTAs face additional challenges due to their slower recovery rates and preexisting health conditions, often resulting in extended hospital stays, increased medical costs, and higher mortality rates.¹¹ Current prevention strategies tend to focus on younger populations, leaving a significant gap in infrastructure, research, and policy development tailored to the unique needs of elderly road users.

Despite the growing recognition of RTAs among elderly road users in Malaysia, there remains a significant gap in understanding the specific circumstances under which these incidents occur and the mechanisms by which elderly individuals are involved in such accidents. Limited research has been conducted to explore the factors contributing to their vulnerability, including the common situational contexts, such as the types of roads, traffic conditions, or behaviours leading to accidents. Furthermore, there is insufficient data on how physiological, cognitive, and environmental factors interact to increase the likelihood of RTAs among elderly road users. This gap in knowledge hampers the development of comprehensive, evidence-based interventions aimed at reducing the risks faced by this demographic on the road.

This paper seeks to address these gaps by critically examining the existing literature on the determinants of RTAs among the elderly in Malaysia. Thus, this scoping review aims to identify and determine the risk factors associated with road traffic accidents among elderly road users in Malaysia. The findings are expected to inform future prevention and mitigation strategies that are specifically designed to meet the needs of this growing demographic. Despite the rising incidence of RTAs in Malaysia, progress in targeted prevention efforts has been limited, highlighting the urgency for a more focused and informed approach.

METHODOLOGY

The scoping review has been conducted based on the six-stage framework for reviews developed by Arksey and O'Malley (2005) and a modified method used by Colquhoun et al. (2014).^{12,13} This process involves identifying the research question, identifying relevant studies, selecting the studies, charting the data, collating, summarizing, and reporting results and ongoing consultation with stakeholders. This review was presented in accordance with the PRISMA Extension for Scoping Reviews reporting guidelines.¹⁴ Our research team were involved in all steps of this review and the results were discussed.

Eligibility criteria

The inclusion criteria were: (a) Research studies referring to the risk factors or determinants of RTAs involving elderly road users, whether as pedestrians, cyclists, or using other forms of land transport; (b) Published in English languages; (c) Published between year 2012 and 2022, and; (d) Quantitative, qualitative, mixed methods, guidelines or reports guideline articles. The literature search was cross-referenced with references of the included studies. Records retrieved that did not meet these criteria were excluded.

Information sources and search strategies

To identify potentially relevant document, the following databases were searched from 2012 to 2022: Springer, Scopus, Science Direct, Web of Science, and Taylor & Francis. The search strategy incorporated both Medical

Subject Headings (MeSH) terms and free-text keywords, with refinements made through team discussions. Truncation and wildcard parameters including Boolean connectors “AND/OR” techniques were applied to ensure that the search focused on the specific key terms. See Appendix 1 for the full search strategy and a detailed search narrative.

The final search results were exported into Mendeley Reference Management Software and duplicates were removed.

Selection of the articles, data charting and data item

The first author performed an initial sorting of the articles and only kept those meeting the inclusion criteria. Subsequently, the other two authors worked in pairs and evaluated titles, abstracts and full texts of all potentially relevant publications. A data-charting form was jointly developed by the research team to determine which variables to extract. Two authors independently charted the data, discussed the results and continuously updated the form in an iterative process. The articles were summarised according to the following information: Year, country, study design, database resource, type of vehicle involved and the study’s location.

Synthesis of results

The findings from each paper were extracted by the reviewers for summary and comparison purposes. Data were subjected to a narrative synthesis with the findings presented as a narrative summary organised into themes. In relation to our scoping review aim, information regarding the determinants or risk factors of RTAs involving elderly were extracted. Commonalities and patterns in the extracted data were summarised using the descriptive-analytical method.

RESULTS

Selection of sources of evidence

We initially identified 1,578 records through database searches. After removing 255 duplicates, 1,323 articles remained for screening based on their titles and abstracts, following our inclusion and exclusion criteria. This

process narrowed the selection to 151 articles, but after full-text review, 136 were excluded for not meeting the criteria for defining elderly or focusing on the determinants of RTAs. Ultimately, 15 articles were selected for comprehensive synthesis. The study selection process was shown in Figure 1.

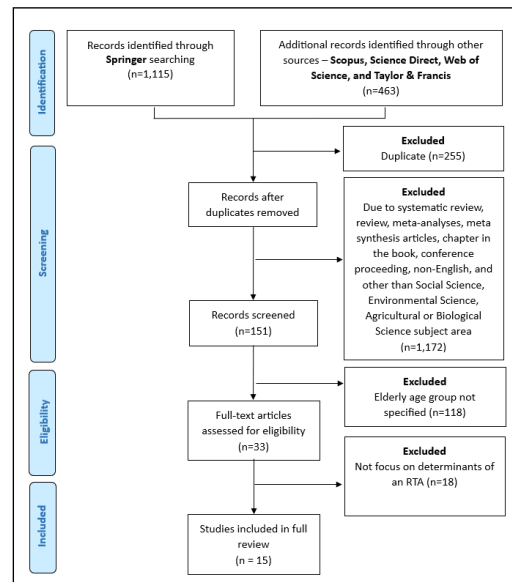


Figure 1: Search strategy for eligible articles

Characteristics of sources evidence

All selected studies were involving elderly in Malaysia and published in past eleven years, between year 2012 and 2022. Out of 15 articles, one (6.7%) article published respectively in year 2021, 2018, 2017, and 2012, four (26.7%) articles in 2020, three (20.0%) articles in 2019, and two (13.3%) articles respectively in 2016 and 2014. According to study design, 11 (73.3%) studies adopting cross-sectional, while two (13.3%) used qualitative method, one (6.7%) applied case-control and another one (6.7%) applied experimental study. Most (93.3%) studies were based on the primary data and only one (6.7%) study utilised secondary data. There are four types of vehicles studied in the selected articles, which were car, motorcycle, bus and pedestrian. Six (40.0%) studies analysed only car, four (26.7%) studies on car and motorcycle, two (13.3%) studies involve car, motorcycle and pedestrian, one (6.7%) study on both car and pedestrian, one (6.7%) study only on bus and the other one study (6.7%) among pedestrians. The study period ranged from three months to three years. The summary of the characteristics of the selected articles were presented

in Table 1. The details of the selected articles according to authors' name, year of publication, the title, study design applied, type and source of the data, sample size, vehicle type and study period were shown in Table 2.

Table 1: Characteristics of selected articles (n=15)

Characteristics	n (%)
Study design	
Cross-sectional	11 (73.3%)
Qualitative	2 (13.3%)
Case-control	1 (6.7%)
Experimental	1 (6.7%)
Type of data	
Primary	14 (93.3%)
Secondary	1 (6.7%)
Vehicle type analysed	
Car	6 (40.0%)
Car & motorcycle	4 (26.6%)
Car, motorcycle & pedestrian	2 (13.3%)
Car & pedestrian	1 (6.7%)
Pedestrian	1 (6.7%)
Bus	1 (6.7%)

Determinants of RTAs among elderly in selected articles

The determinants of RTAs among elderly were categorised into four domains, which were medical condition, discussed in eight (50.0%) articles; physical capability in eight (50.0%) articles; driving nature in three

(18.8%) articles; and environment in nine (56.3%) articles. The summary of these determinants was shown in Table 3.

Medical condition

Five key themes emerged regarding medical conditions as determinants of RTAs among the elderly. Cognitive impairment was the most prominent theme, followed by medical illnesses, visual impairment, depression, and the adverse effects of medication. Cognition refers to intellectual functions requiring mental processes such as thought, experience, and sensory input.¹⁵ A study conducted in Peninsular Malaysia reported that 47.2% of 212 elderly participants experienced chronic insomnia.¹⁶ Those affected were more likely to drive while feeling sleepy (OR 1.12, p=0.032, 95% CI: 1.01-1.125), and one in five reported falling asleep while driving (OR 1.07, p=0.016, 95% CI: 1.01-1.14). Another study involving 500 elderly individuals found that 51% of motorcycle riders and 26% of car drivers had been involved in RTAs

Table 2: Details on characteristics of selected articles (n=15)

Author(s) (Year)	Research Title	Study Design	Type & Source of Data	Sample size (n)	Vehicle Type	Study period
Rahman <i>et al.</i> (2021)	Comparison of driving difficulty between bilateral cataract and non-cataract elderly drivers in Malaysia	Case-control study	Primary data (interview & questionnaires) in Malacca	61	Car	3 months (Oct. – Nov. 2017)
Ang <i>et al.</i> (2020)	The influence of spouses and their driving roles in self-regulation	Qualitative study	Primary data (semi-structured & guided interviews) in Selangor & Kedah	11	Car	1 year & 6 months (Jan. 2017 – Apr. 2018)
Qandeel & Jehom (2020)	Patterns of living environment among itinerant elderly community in Malaysia	Qualitative study	Primary data (semi-structured interviews) in Kuala Lumpur	14	Car & pedestrian	1 year (2018 – 2019)
Roshi <i>et al.</i> (2020)	Driving behaviour of elderly drivers in Malaysia	Cross-sectional study	Primary data (observation & self-administered questionnaires) in Johor	240	Car	1 year (2015 – 2016)
Zuwairy <i>et al.</i> (2020)	Road traffic accidents: A descriptive study of commuting injury among healthcare workers in Malaysia	Cross-sectional study	Secondary data (MOH, Malaysia) in Malaysia	113	Car, motorcycle & pedestrian	3 years (2014 - 2016)
Ang <i>et al.</i> (2019)	Self-regulatory driving and riding practices amongst older adults in Malaysia	Cross-sectional study	Primary data (self-administered questionnaires) in Selangor & Kedah	637	Car & motorcycle	2 years (2016 – 2018)
Ang <i>et al.</i> (2019a)	The Malay Manchester driver behaviour questionnaire: A cross-sectional study of geriatric population in Malaysia	Cross-sectional study	Primary data (questionnaires) in Selangor & Kedah	500	Car & motorcycle	2 years (2016-2018)
Anuar <i>et al.</i> (2019)	Senior driver performance on airport road access wayfinding design	Experimental study	Primary data in Kedah	64	Car	1 year (2018)
Majid <i>et al.</i> (2018)	Assessment on sitting posture relation to risk factors by using chi-square test among elderly taxi drivers in Peninsular Malaysia	Cross-sectional study	Primary data (self-administered questionnaires) in Peninsular Malaysia	500	Car	1 year (2016)
Hong <i>et al.</i> (2017)	Significant factors for Malaysian older drivers or riders to give up their keys	Cross-sectional study	Primary data (rigid & structured questionnaires) in Johor	105	Car & motorcycle	1 year (2015)
Al-bargi <i>et al.</i> (2016)	Crossing behaviour of pedestrians along urban streets in Malaysia	Cross-sectional study	Primary data (observation & self-administered questionnaire) in Kuala Lumpur	448	Pedestrian	1 year (2014)
Razali <i>et al.</i> (2016)	Sleep quality and psychosocial correlates among elderly attendees of an urban primary care centre in Malaysia	Cross-sectional study	Primary data (structured questionnaires) in Klang Valley	123	Car & motorcycle	1 years (2014)
Mahdi <i>et al.</i> (2014)	Risk factors for near miss incident among long distance bus drivers in Malaysia	Cross-sectional study	Primary data (questionnaires) in East Coast Malaysia	517	Bus	1 years (2013)
Sukor <i>et al.</i> (2014)	Mobility of the elderly at rural area factors affecting the activity trips and mode choice	Cross-sectional study	Primary data (self-administered questionnaires) in Johor	242	Car, Motorcycle & Pedestrian	1 year (2012)
Zailinawati <i>et al.</i> (2012)	Prevalence of insomnia and its impact on daily function amongst Malaysian primary care patients	Cross-sectional study	Primary data (self-administered questionnaires) in Peninsular Malaysia	212	Car	1 year (2007)

over the past five years, primarily due to difficulties in attention and concentration.¹⁵

Elderly with dementia also face significant challenges in vehicle handling and navigating familiar routes, which is associated with a heightened risk of RTAs (OR 13.89, $p=0.035$, 95% CI: 1.33-144.59).¹⁷ Advancing age is also linked to the onset of medical conditions that impair driving ability. A study by Ang et al. (2019) involving 647 elderly individuals found that the majority were diagnosed with at least one comorbidity, with 67% of drivers and 70% of riders affected.¹⁷ Car drivers with a history of stroke had significantly higher odds of RTAs (OR 4.09, $p=0.033$, 95% CI: 1.09-15.40), while motorcycle riders with diabetes also exhibited a higher risk (OR 2.72, $p<0.001$, 95% CI: 1.39-5.32). Arthritis was found to increase the odds of RTAs for both drivers and riders (OR 2.32, $p=0.041$, 95% CI: 1.20-4.66).

Visual impairments caused by medical conditions can significantly compromise the driving abilities of elderly individuals, affecting their safety and performance on the road. A study in Malacca reported that elderly individuals with cataracts faced significantly greater difficulty driving in rainy conditions ($p=0.034$), at night ($p=0.005$), and during traffic congestion ($p=0.013$) compared to those without cataracts.¹⁸ Depression and medication side effects were also identified as important determinants. Elderly drivers and riders experiencing depression had higher odds of RTAs (OR 1.84, $p<0.001$, 95% CI: 1.18-2.89) due to more frequent aberrant driving behaviours and lapses.¹⁷ Additionally, a study in Johor found that 57.9% of elderly drivers were taking medications for various health conditions, with many reporting that newly prescribed medications caused dizziness, drowsiness, and delayed reaction times when interpreting road signs or manoeuvring the vehicle.¹⁹ This condition often diminished their confidence while driving, particularly during peak traffic hours, thereby increasing their risk of RTAs.²⁰

Physical capability

Two key themes emerged regarding physical capability as determinants of RTAs among the elderly: reduced

physical strength and flexibility, and increased susceptibility to fatigue. A qualitative study among elderly drivers highlighted poor hand grip strength and lower limb weakness as factors leading to delayed reactions and an increased risk of RTAs.²¹ Additionally, 58.2% of elderly drivers with a history of RTAs reported that poor joint flexibility and muscle weakness were contributing factors.¹⁷ Musculoskeletal problems also made driving in tight spaces, navigating corners, making U-turns, and responding to dangerous situations challenging for 68.5% of elderly drivers.^{19,20} Moreover, elderly pedestrians were found to be the slowest when crossing heavy traffic roads.²²

In terms of commuting-related injuries, senior workers had the highest incidence of RTAs, with 28.2 per 100,000 compared to 15.3 per 100,000 in other age groups. This heightened risk was attributed to increased susceptibility to fatigue from prolonged working hours and long-distance commuting.²³ Furthermore, a study revealed that 20.5% of elderly workers experienced microsleep while driving or riding after work due to fatigue.²⁴

Driving nature

Three key themes emerged regarding the nature of driving as determinants of RTAs among the elderly: long hours or distance driving, poor ergonomics, and driving alone. Long-distance driving was the most commonly discussed theme. A qualitative study found that elderly drivers experienced navigation difficulties after prolonged driving distances or extended periods in traffic jams.²¹ Additionally, 75.8% of 120 elderly taxi drivers reported driving more than 250 kilometers per week, with 60.4% attributing their fatigue to long-distance driving.²⁵ A similar study among bus drivers revealed that older drivers exhibited significantly reduced attention and concentration after four hours of driving compared to younger age groups.²⁶

Furthermore, driving alone and poor ergonomics were identified as contributing factors. Elderly drivers expressed greater confidence when driving long distances with a spouse or companion, as they believed their presence enhanced alertness and reduced the risk of

RTAs.²¹ In another study of elderly taxi drivers, 33.3% reported discomfort due to seat design, with 92.5% experiencing back pain and lower extremity discomfort. Moreover, 84.2% of elderly taxi drivers believed that poor seat ergonomics increased their risk of RTAs.²⁵

Environment

Three key environmental factors were identified as determinants of RTAs among the elderly: poor road conditions and visibility, reckless road users, and poorly maintained or older vehicles. Among these, poor road conditions and visibility were the most commonly discussed. A simulated study by Anuar et al. (2019) found that inadequate signage and excessive roadside advertisements increased confusion among elderly drivers, leading to a significantly higher risk of RTAs compared to younger drivers (mean: 1.67, SD: 0.82 versus mean: 0.75, SD: 0.96).²⁷ Additionally, a rural area study in Johor reported that 36.5% of 241 elderly riders experienced an RTAs in the past year, with 88.0% attributing the accidents to poor road conditions, such as inadequate night lighting and potholes.^{18,28} Furthermore, the complexity of urban road environments, marked by road junctions, flyovers, and numerous traffic signs, further diminishes focus and attention among elderly drivers, thereby heightening their risk of RTAs.²⁷

Reckless road users were also identified as a major risk factor for elderly drivers. Qualitative research found that elderly drivers were more susceptible to RTAs due to delayed reactions when encountering reckless drivers.²¹ A similar study among elderly pedestrian in Kuala Lumpur also has poor confidence in road crossing due to reckless motorist.^{22,29} Additionally, 44.4% of RTAs involving elderly drivers were attributed to distractions caused by other road users, including reckless motorists.¹⁹ Furthermore, a significant proportion of elderly taxi drivers (56.7%) were found to be operating vehicles over 10 years old, which lacked modern safety features and presented challenges in maneuvering.²⁵

Table 3: Distribution of RTAs determinants among elderly in Malaysia in selected articles

Author(s) (Year)	Medical Condition					Physical Capability		Driving Nature		Environment				
	Cognitive impairments	Medical illness	Visual impairments	Depression	Adverse medication effect	Poor physical strength & flexibility	Fatigability	Long hours or distance	Driving alone	Poor ergonomics	Poor road condition & visibility	Road complexity	Reckless behaviour of other road users	Poorly maintained or old vehicles
Rahman <i>et al.</i> (2021)			✓								✓			
Ang <i>et al.</i> (2020)						✓		✓	✓					✓
Qundesi & Isbom (2020)														✓
Rosli <i>et al.</i> (2020)					✓	✓								✓
Zuraini <i>et al.</i> (2020)							✓							
Anuar <i>et al.</i> (2019)											✓	✓		
Ang <i>et al.</i> (2019)	✓	✓	✓	✓		✓								
Ang <i>et al.</i> (2019a)	✓													
Majid <i>et al.</i> (2018)								✓		✓				✓
Hong <i>et al.</i> (2017)	✓	✓				✓								
Al-bargi <i>et al.</i> (2016)						✓					✓			✓
Razali <i>et al.</i> (2016)							✓							
Mahdi <i>et al.</i> (2014)	✓						✓	✓						
Sukor <i>et al.</i> (2014)											✓			✓
Zailinawati <i>et al.</i> (2012)	✓	✓		✓	✓									

DISCUSSION

The rapid industrialization of Malaysia, along with the development of an advanced transportation network and diverse modes of transport, has undoubtedly improved the quality of life for the elderly population. These advancements have made transportation more accessible; however, they have also contributed to an increased risk of RTAs, rising healthcare costs, and the loss of productive lives.³⁰ The growing number of elderly individuals as active road users across various transport modes-such as driving, walking, and cycling-has amplified their involvement in RTAs.

Despite this, efforts to comprehensively understand the determinants of RTAs among the elderly in Malaysia remain limited. A review of the literature from 2012 to 2022 identified only 15 relevant studies, indicating either a lack of research focus in this area or a genuine scarcity of published work. This gap highlights the urgent need for more focused investigations into the factors contributing to RTAs among elderly road users. A meta-

analysis study on the global epidemiology of RTAs among the elderly highlighted the insufficient number of studies despite the notable prevalence and fatality.³⁰ Furthermore, developing and low-income countries face limited research due to capacity constraints, under-reporting, and poor coordination between agencies, making the formulation of appropriate interventions and strategies to address the issue challenging.³¹

The determinants of RTAs were categorized into four domains-medical condition, physical capability, driving nature, and environment-to systematically address the complex factors that contribute to accident risk. This structured classification enables a clearer understanding of how various aspects of an elderly individual's health, behaviours, and external conditions interact to influence their involvement in RTAs. By organizing these factors, it allows for a more targeted and comprehensive approach to addressing the specific vulnerabilities of elderly road users, facilitating the design of interventions tailored to their unique needs.

Within the medical condition domain, cognitive impairment emerged as a predominant theme. Cognitive functions, including attention, memory, and executive processes, typically deteriorate with advancing age, adversely affecting driving performance. Older drivers may experience challenges in processing complex traffic scenarios, which can increase the likelihood of collisions. Additionally, they are more prone to misjudging traffic gaps, potentially resulting in hazardous driving conditions.³² In addition to cognitive decline, older adults frequently experience medical conditions such as metabolic or endocrine disorders, delirium, dementia, and Alzheimer's disease, all of which further elevate their risk of RTAs. A study conducted in Sweden revealed that elderly individuals with diabetes or a history of mild stroke face a significantly increased risk of RTAs.³³ Similar findings have been reported in studies from Malaysia and other countries, underscoring the global relevance of these health factors in contributing to driving hazards among older populations.^{19,34-37} This condition damages blood vessels, reduces blood flow to the brain and lead to slower reaction times, difficulty

concentrating, and impaired decision-making, thus increasing the risk of RTAs.³⁸

Dementia impairs critical cognitive functions such as judgment, decision-making, and reaction time, diminishing the ability of drivers to effectively respond to dynamic road conditions or emergencies. Furthermore, dementia affects spatial awareness, making it difficult for individuals to accurately judge distances, and can lead to emotional instability, resulting in erratic driving behaviors.³⁹ These combined cognitive deficits significantly increase the risk of road traffic accidents (RTAs) among individuals with dementia. Adverse effects of medications, including nerve disturbances, gastrointestinal discomfort, and drowsiness, are commonly experienced by elderly individuals. These side effects can impair concentration and alertness, thereby increasing the risk of road traffic accidents (RTAs) by reducing their ability to react promptly and appropriately to driving conditions.⁴⁰

Reduced mobility and flexibility further hinder older adults' ability to execute essential driving manoeuvres. Limitations such as decreased neck rotation, which impairs their ability to check blind spots, and slower reaction times in emergency situations, exacerbate the challenges they face on the road.⁴¹ These physical declines contribute to the overall increased risk of accidents in this age group. Similar findings were reported in Germany, where elderly individuals experienced difficulties stepping over curbs due to sarcopenia.⁴² In Japan, muscle degeneration and challenges with stepping over curbs were also linked to increased RTA risk among elderly pedestrians.⁴³ Additionally, fatigability, particularly following prolonged driving, was found to be a significant contributor to RTAs in China, even among non-comorbid elderly individuals.^{44,45} In contrast, younger drivers were able to maintain attention during long driving periods by employing strategies such as consuming caffeinated beverages and listening to music.⁴⁶

Within the driving nature domain, factors such as driving in long hours or distances, poor attention and concentration after extended periods of driving also

related with poor coping mechanism to maintain their focus. Younger drivers are better at maintaining their attention by taking caffeinated drinks and listening to music.⁴⁶ Vehicle ergonomics, including seat and steering design, as well as sitting position, are generally not tailored for the specific needs of elderly drivers. Age-related issues such as reduced flexibility and joint stiffness make it difficult for older adults to adapt to standard vehicle designs, leading to discomfort and fatigue during driving.^{47,48} Additionally, while having a companion or spouse may reduce the likelihood of accidents, this benefit is uncertain, as elderly companions often face similar cognitive and attention challenges.⁴⁹ Many elderly individuals drive vehicles over 10 years old, lacking modern safety features, as seen in a German study where 75.5% reported using such cars, increasing their risk of RTAs.⁵⁰

A study on Malaysian federal roads found that poor road conditions, such as potholes, can lead to sudden loss of vehicle control, particularly among elderly drivers.⁵¹ Furthermore, poor lighting exacerbates the already diminished night vision common in older adults, delaying their ability to recognize hazards in time. Additionally, uneven or poorly marked roads can confuse elderly drivers, who often face challenges with spatial awareness and slower reaction times, thereby increasing their susceptibility to road traffic accidents. Additionally, reckless behaviour by other road users, such as motorists making sudden lane changes, can startle elderly drivers and provoke impulsive reactions, which may lead to road traffic accidents.⁵²

LIMITATION

The search focused on English-language studies in five databases, excluding articles in other languages due to translation limitations. Future reviews are advised to include Malay or other languages and expand the search across more databases for a comprehensive view. The current review covers articles from 2012 onward, potentially limiting insights. Most of the selected articles utilized cross-sectional study designs, providing recent population-based data. However, this approach often lacks the depth required to comprehensively analyse the

underlying determinants of RTAs in this demographic. Important factors such as elderly road users' knowledge and awareness of road safety, their preventive practices, and the influence of local cultural contexts were insufficiently examined in the reviewed studies.

CONCLUSION

This scoping review offers an overview of the existing scientific literature on road traffic accidents (RTAs) involving the elderly in Malaysia. It highlights key determinants grouped into four domains—medical conditions, physical capability, driving nature, and environmental factors—that contribute to RTAs in this population. Addressing these determinants is crucial for policymakers and stakeholders to implement effective interventions aimed at ensuring the safety of elderly road users. As Malaysia approaches an aged-nation status by 2030, such measures are essential to accommodate the growing elderly population and reduce their vulnerability to RTAs.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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