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Water safety awareness, swimming ability and drowning prevention behaviour in Malaysian adolescents: a sex-based analysis

Conciencia sobre la seguridad en el agua, capacidad para nadar y comportamiento de prevención de ahogamiento en adolescentes malasios: un análisis basado en el sexo

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Abstract. This study explored water safety awareness, swimming ability and drowning prevention behaviour among Malaysian adolescents aged 13-17. A cross-sectional study was conducted with 525 secondary school students (278 boys and 247 girls) from five regions in Malaysia. Data collected through a self-administrated online survey (modified water safety and drowning prevention questionnaire) using Google Form. Both sexes demonstrated similar awareness levels of drowning dangers identification and water safety tasks and rules. Most of the respondents were categorised as non-swimmers. Notably, 57% of them could not swim while a quarter could swim less than 50 meters. Only 17% claimed adequate swimming ability. Boys demonstrated significantly higher swimming ability compared to girls, though girls reflected better safety practices with a lower risk in swimming: alone/unsupervised, in prohibited areas and in unknown water depth. These findings provide additional knowledge in educational policies to develop impactful lifelong drowning prevention programs in Malaysia.
Keywords: adolescents; drowning prevention; sex equity; swimming; water safety awareness

Resumen. Este estudio exploró la conciencia sobre la seguridad en el agua, la capacidad de nadar y el comportamiento de prevención de ahogamiento entre adolescentes malasios de entre 13 y 17 años. Se realizó un estudio transversal con 525 estudiantes de secundaria (278 niños y 247 niñas) de cinco regiones de Malasia. Datos recopilados a través de una encuesta en línea autoadministrada (cuestionario modificado de seguridad en el agua y prevención de ahogamiento) utilizando Google Form. Ambos sexos demostraron niveles similares de conciencia sobre la identificación de peligros de ahogamiento y las tareas y reglas de seguridad en el agua. La mayoría de los encuestados fueron clasificados como no nadadores. En particular, el 57% de ellos no sabía nadar, mientras que una cuarta parte podía nadar menos de 50 metros. Sólo el 17% afirmó tener una capacidad de natación adecuada. Los niños demostraron una capacidad de natación significativamente mayor en comparación con las niñas, aunque las niñas reflejaron mejores prácticas de seguridad con un menor riesgo en la natación: solos/sin supervisión, en áreas prohibidas y en profundidades de agua desconocidas. Estos hallazgos proporcionan conocimiento adicional en políticas educativas para desarrollar programas impactantes de prevención de ahogamiento de por vida en Malasia.
Palabras clave: adolescentes; prevención de ahogamiento; equidad sexual; nadar; concientización sobre la seguridad del agua

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Introduction

Drowning poses a significant global health concern, with an estimated 295,000 deaths reported annually worldwide (Peden et al., 2021). Drowning is the third leading cause of accidental injuries, thereby contributing to 7% of injury-related deaths worldwide (Hossain et al., 2016; Tyler et al., 2017). Based on statistics from the World Health Organization (WHO), persons under the age of 20 account for 45% of drowning victims globally (Guevarra et al., 2021).

In Malaysia, drowning is one of the top five causes of mortality among children and adolescents, which raises serious concerns about fatality and morbidity rates (Amar et al., 2014). Malaysia faces a high risk of drowning incidents given its abundant water bodies and recreational opportunities (Farizan et al., 2020). Tragically, these incidents often occur during public and school holidays and in natural water bodies such as ponds, ditches, rivers, lakes, and dams (Rahman et al., 2017). Boys are 3.5 times more likely to drown compared to girls (WHO, 2022). Despite the implementation of drowning prevention campaigns and educational initiatives programs in several countries (Rahman et al., 2012; Abelairas-Gomez et al., 2019; Nunes et al., 2024), Malaysia still lags in such interventions even with abundant water environment and resources. Therefore, a closer examination of drowning prevention programs in Malaysia is warranted (Farizan et al., 2020).

Water safety education and swimming skills have emerged as crucial components for lifelong drowning risk reduction (Peden et al., 2018). Hence, the lack of data on water safety awareness, swimming skills, and risky behaviour around water remains a critical gap in drowning prevention efforts (Szpilman et al., 2022). Asian students, in particular, face heightened drowning risks due to inadequate practical survival skills and a poor understanding of water safety principles (Moran & Wilcox, 2013; Tyler et al., 2017; WHO, 2022). Factors of sex, behaviour, age, and environmental and cultural context contribute to drowning risk factors, with boys being the most frequently reported victims (Rahman et al., 2012; Hossain et al., 2022). In addition, this risk is heightened among people with low swimming skills, (Nunes et al., 2024; Koon et al., 2021), who may have less access to learn swimming and water safety education for different reasons (Woods et al., 2022; Ordonhes et al., 2021).

Although education is recognised globally as a key factor in drowning prevention (Katchmarchi et al., 2018; Leavy

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et al., 2023; Peden et al., 2018), this important aspect in drowning management is yet to be prioritised by Malaysia's educational policies (Farizan et al., 2019). The lack of information on drowning events and limited data on water safety awareness and swimming skills in children and adolescents constitutes a critical gap in elucidating the underlying issue (Amar et al., 2014; Farizan et al., 2020; Alfonso et al., 2021).

This study aims to bridge the knowledge gap by providing comprehensive data on water safety knowledge, skills, and behaviour among adolescents in secondary schools, who are at a crucial age for learning water safety and swimming competency (Katchmarchi et al., 2018; Peden et al., 2021; Tipton et al., 2021). In order to fill the existing gaps, a sex analysis was conducted in this study while identifying the current state of water safety awareness, swimming ability, and drowning prevention behaviour during aquatic activities or swimming. The findings from this study will provide the foundation for disseminating water safety awareness and foster a supportive educational environment, ultimately contributing to effective drowning prevention among adolescents in Malaysian society.

Methodology

Survey Design

This study employed a cross-sectional study design to collect population-based data overseen by physical education teachers in secondary schools. Approval for the study was granted by the Research Innovation Review Board at the University of Sultan Idris Education.

Participants

Purposeful sampling was used for data collection. According to the Cochran formula, a sample size of 385 was recommended for the secondary school population (N = 2020000) at a specified confidence level (p = 0.05) and variability. Nevertheless, a total of 561 secondary school students aged 13-16 years (boys: 286 and girls: 275) consented to participate in the study and 525 students (boys: 278 and girls: 247) completed all the questions in the online survey questionnaire. The respondents were drawn from five regions of Peninsular Malaysia: Central Region (Federal Territories of Kuala Lumpur, Selangor: n = 123), Northern Region (Penang, Perak, Perlis; n = 135), and Southern Region (Johor, Malacca: n = 96), Eastern (Sarawak; n = 82) and Northeast (Kelantan: n = 89). Overall, 36 respondent answers were excluded from data analysis due to incomplete responses.

Instruments and procedure

Data collection in this study was performed through an online questionnaire, specifically a Google Form survey. The questionnaire, focusing on water safety awareness, swimming ability, and drowning prevention behaviour (Knowledge, Skill and Behaviour), was modified through consultation and deliberation with Kevin Moran (in July 2022), who previously developed and validated the 'Drowning Risk Perception and Prevention Skill Questionnaire' for New Zealand's national water safety (Moran, 2008; Moran & Wilcox, 2013). The questions were refined for content validity following a pilot study involving 42 secondary school students. Based on standardised items, the Cronbach's alpha value for the validity of the questionnaire after modification was 0.96.

In addition, the final questionnaire was prepared in both English and Malay languages and comprised sections on basic demographics, the knowledge of water safety awareness, swimming ability, and drowning prevention behaviour. Based on the results from the pilot study, the research team proposed that respondents who can swim and considered as a swimmer, answered the drowning prevention behaviour questions. Then the modified questionnaire comprises three sections, firstly focussing on water safety awareness and drowning knowledge in three aspects including drowning danger identification, water safety preparation tasks and water safety rules, secondly on swimming ability with two skills and four sub-categories, and then the respondents who answered positively the swimming ability, in the next step answered the last section of prevention behaviour. In that, the instrument addressed three main aspects of water safety awareness divided in the sections of knowledge (n = 15 questions), swimming ability (comprising two skills), and drowning prevention behaviour during swimming (n = 7 questions). Multiple-choice and pictorial options, such as the colour of beach flags indicating risky, or safe entry/exit areas were used in representing answer choices for some questions. It took approximately 30 minutes for each respondent to complete the questionnaire. Meanwhile, basic demographic information such as age and sex were recorded.

Table 1.
A summary of water safety awareness questions

Category	Question (multi-select answer)
Drowning danger identification	Where is the safe entry and exit way in the pool?
	Which of the places around the home could be potential water dangers?
	Who is responsible for your drowning danger in nearby water bodies (pool, beach, river, lake, …)?
	What is the emergency call if someone needs help near the water?
	Which lifesaving equipment is used when close to water bodies?
Water safety preparation tasks	Who should supervise the kids near the water?
	Which weather conditions should be avoided for outdoor swimming?
	How can you determine the depth of a pool?
	What are good ways to be safer around a pool?
	What are the steps to take to prevent drowning?
Water safety rules	Which colour are the beach safety flags?

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	Which colour are the beach risky flags?
	Which signs show that a person might be drowning?
	How to make sure you are safe when you are on the boat?
	How to make sure you are safe when swimming at the beach/pool/river?

The knowledge-related questions were categorised into 'drowning danger identification items' (DDI), 'water safety preparation tasks' (WSPT) and remembering 'water safety rules' (WSR) to assess water safety awareness. Table 1 summarises the knowledge questions categorised into three groups. Meanwhile, questions on swimming ability covered 'swimming skill' and 'floating competency'. Self-reported swimming skill (any stroke) was assessed via six answer categories ranging from 'cannot swim' to the ability to swim 'more than 200 meters'. Floating competency was assessed through four response categories ranging from 'cannot float' to 'more than 4 minutes'. Floating skills or doggy pedalling were considered indicators of floating competency.

For respondents who are capable of swimming and floating, further questions were designed to recall drowning prevention behaviour based on their practices over the last two years of aquatic activities. These inquiries covered adherence to 'safe behaviour in/near water areas' such as swum alone/unsupervised, unknown depth, prohibited area, or dived in unknown depth. In addition, questions addressed 'assuming own responsibility for survival in/near water area or during aquatic activities', including actions taken when cold/tired and adherence to safety direction or the use of lifejacket in boat.

To protect respondents' privacy and confidentiality, a 'Consent Form Section' was created in the 'Google Forms' without name or personal identification. The questionnaire was distributed by 20 physical education teachers recruited from different zones, who provided the link and briefed the respondents about the questionnaire. Respondents accessed the link and answered the questions at the school computer lab. Data were collected from July to December 2022. By the end of the period, 525 eligible questionnaires from secondary school students (13-16 years old) were available for analysis.

Statistical analysis

All documented data in the Google Forms Excel file sheets were transferred to SPSS (version 29) for analysis. Initially, descriptive statistic methods (percentage, frequencies and cross-tabulations) were employed based on sex categories. Given the non-normal distribution of data between the both sexes, non-parametric statistical tests (Chi-square tests and Mann-Whitney U tests) were used to compare boys and girls on swimming and floating competency in four categories from "cannot swim" to the ability to swim "more than 200 meters" or from "cannot float" to "more than 4 minutes" (confidence levels: 95 %). Subsequently, a sex-based analysis was conducted to examine disparities in knowledge, swimming ability, and drowning prevention behaviour.

Results

Of the 525 respondents recruited in this study, 53% (278) of them were boys (14.8 ±1.2 years) and 47% (247) were girls (14.5 ±1.3 years).

Water Safety Knowledge

As depicted in Table 2, most of the respondents reported that they could identify the drowning danger (DDI) in either three to four items (76%) or more than five items (17%). Only a small proportion of the respondents identified one to two items (7%). In water safety preparation tasks (WSPT), more than one-third of the respondents properly answered three to four tasks (79%) or more than five tasks (13%). Only a few of them answered one to two tasks. Besides, more than half of the respondents (66%) identified three to four water safety rules (WSR) and signs, a quarter of them (23%) answered more the five items, while only 11 % of them recognised one to two rules. No significant difference existed between the boys' and girls' answers in DDI (p= 0.12), WSPT (p = 0.9) and WSR (p = 0.079), as depicted in Table 2.

Table 2.
Water safety awareness among the adolescents (n = 525) based on danger identification, safety preparation/task, and safety rules

Drowning Danger Identification*		Water safety preparation task		Water safety rules	
No identity	1% (5) Boy: 3 Girl: 2	Not remember	2% (11) Boy: 6 Girl: 5	Not remember	2% (11) Boy: 6 Girl: 4
1- 2 items	36% (189) Boy: 106 Girl: 83	1- 2 tasks	41% (215) Boy: 113 Girl: 102	1- 2 rule	35% (182) Boy: 102 Girl: 80
3-4 items	51% (267) Boy: 140 Girl: 127	3- 4 tasks	43% (225) Boy: 119 Girl: 106	3- 4 rules	46% (243) Boy: 128 Girl: 115
≥ 5 items	10% (53) Boy: 23 Girl: 30	≥ 5 tasks	12% (63) Boy: 34 Girl: 29	5 ≥ rules	15% (79) Boy: 35 Girl: 44
No answer	2% (11) Boy: 6 Girl: 5	No answer	2% (11) Boy: 6 Girl: 5	No answer	2% (10) Boy: 6 Girl: 4

*Recall any essential safety items and preparatory safety task.

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Swimming Ability

In terms of swimming ability, the respondents were asked to estimate their competence in swimming distance (meters) and floating competency (minutes). Most of them (57%) indicated that they 'cannot swim', while a quarter reported being able to swim less than 25 or 50 meters. Only 8% claimed the ability to swim more than 200 meters. The remaining respondents also expressed the capacity to swim distances ranging from 50 to 100 meters or less than 200 meters (see Figure 1). Similarly, the majority of respondents reported 'Cannot float' (47%) or mentioned being able to float for less than 1 minute (23%) (see Figure 2). Only 13% asserted the ability to float more than 4 minutes, while the rest of them stated they could float from 1 to 2 (9%) or 2 to 3 minutes (7%).

Notably, Mann-Whitney U results revealed a significant disparity between boys and girls in swimming ($p < 0.001$) and floating skills ($p < 0.001$), with boys exhibiting superior swimming ability (see Table 3).

Table 3.
Comparison of water safety awareness and swimming ability between the adolescents' boys (n=278) and girls (n=247)

Question items		*Z* value	Asymp. Sig. (2-tailed)*
Knowledge	Drowning danger identification	1.56	0.121
	Water safety preparation task	0.1	0.9
	Water safety rules	1.78	0.079
Swimming ability	Swimming skill	7.35	< 0.001
	Floating skill	6.72	< 0.001

*Significant at the 0.05 level.

Drowning Prevention Behaviour

In this study, 226 respondents were assessed for their swimming behaviour to prevent drowning as shown in Table 4. The respondents provided insights into their safe practices and personal responsibility for survival in/near water areas or during aquatic activities through a set of seven questions.

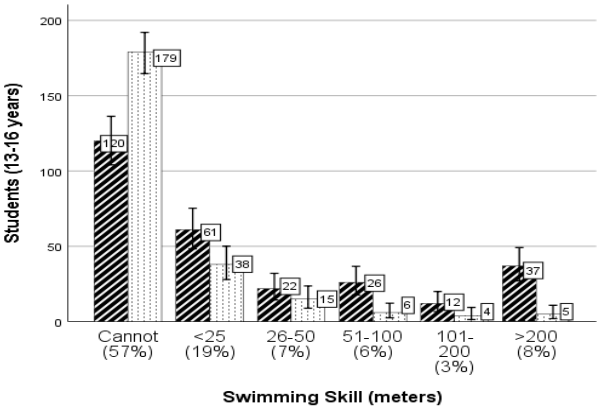

Figure 1. Comparison of *Swimming Skills* between the adolescents based on sex

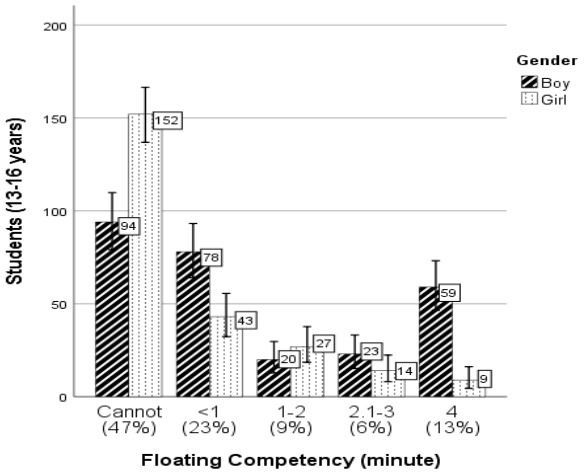

Figure 2. Comparison of *Floating Competency* between the adolescents based on sex

Table 4.
Drowning prevention behaviour during swimming (n = 226)

Drowning Prevention Behaviour Questions (over the past 2 years)	Boys (n=158) Girls (n= 68)	Always % (N)	Often % (N)	Sometimes % (N)	Rarely % (N)	Never % (N)	No answer % (N)
Swim alone/unsupervised	Total	6 (14)	5 (11)	10 (23)	41 (94)	36 (81)	2 (3)
	Boys	12	11	16	84	33	2
	Girls	2	-	7	10	48	1
Swim out of Portal and prohibited area of lake, river, sea	Total	13 (29)	20 (45)	17 (38)	22 (50)	28 (63)	
	Boys	24	36	27	43	27	1
	Girls	5	9	11	7	36	-
Swim in Unknown Depth	Total	1 (2)	2 (4)	3 (7)	20 (45)	72 (162)	2 (6)
	Boys	3	4	6	34	106	5
	Girls	-	-	1	11	56	1
Swim when Tired or Cold	Total	3 (7)	6 (14)	12 (27)	17 (38)	60 (135)	2 (5)
	Boys	5	10	16	31	92	4
	Girls	2	4	11	7	43	1
Dive in Shallow/unknown depth	Total	1 (2)	8 (18)	14 (32)	4 (9)	69 (155)	4 (10)
	Boys	2	15	18	6	109	8
	Girls	-	-	-	-	-	-
Ignore Safety Directions/ Instruction	Total	-	10 (23)	9 (20)	17 (38)	61 (138)	3 (7)
	Boys	-	15	10	26	102	5
	Girls		8	10	12	36	2

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	Total	-	4 (9)	21 (47)	7 (16)	65 (147)	3 (7)
Ignore Life Jacket in Boat	Boys	-	6	34	11	102	5
	Girls		3	13	5	45	2

A significant portion of respondents indicated never (41%) or rarely (36%) swum alone/unsupervised. The remaining participants reported engaging in solo swimming two years ago with 10% doing so sometimes, 5% often, and 6% always. In terms of drowning prevention, the girl students were less likely to swim alone or unsupervised compared to the boy students ($p < 0.001$) (see Table 5).

Regarding swimming out of portal and prohibited areas, half of the respondents reported never (28%) or rarely (22%) doing so, 17% indicated sometimes (17%), 20% often, and 13% always swim out of these boundaries. For drowning prevention, the girl students were less likely to swim alone or unsupervised. As depicted in Table 5, girl students exhibited better adherence to safety practices and demonstrated a lower risk of drowning compared to boy students ($p < 0.001$).

Concerning swimming in unknown depth, most respondents stated never engaged in such an activity (72%), with a smaller percentage rarely doing so (20%). Only 6% of boys claimed to have participated in swimming in an unknown depth of water. Moreover, girl students were less likely ($p < 0.03$) to participate in swimming activities in the location where water depth was unknown, with much emphasis on practising drowning prevention (see Table 5).

A higher proportion of respondents (60%) asserted that they engaged in swimming when tired or cold, with an additional 17% rarely doing so. In contrast, 69% and 61% of respondents mentioned never having engaged in diving in the shallow/unknown depth and ignored safety directions/instructions, respectively. No significant difference was observed in these swimming behaviours between girl and boy students ($p > 0.05$). Although the girls' students exhibited slightly superior self-care behaviour, the differences were not statistically significant ($p = 0.075$).

In terms of drowning prevention behaviours, the majority of respondents (65%) claimed to never having ignored life jackets in the boats, whereas a small percentage rarely did so (7%). Meanwhile, a quarter of the participants admitted to sometimes (21%) or often (4%) neglecting the use of life jackets. No significant difference was identified in disregarding life jackets in boats based on sex ($p = 0.83$) (see Table 5).

Table 5.
Comparison of drowning prevention behaviour between the adolescents' boys (n=158) and girls (n=68)

Question Values		*Z* value	Asymp. Sig. (2-tailed)*
Drowning prevention Behaviour	Swim alone/unsupervised	6.07	0.000
	Swim out of the portal	4.19	0.000
	Swim in unknown depth	2.18	0.03
	Swim tired/cold	0.28	0.77
	Dive in unknown depth	0.14	0.89
	Ignore safety directions	1.78	0.075
	Ignore life jacket in boat	0.21	0.83

Discussion

This cross-sectional study, as the first attempt, aimed to investigate awareness of water safety, swimming ability and drowning prevention among girl and boy adolescents (13-16 years old) from secondary schools in five regions of Peninsular Malaysia. The study findings revealed that the most of respondents identified the drowning danger, water safety preparation tasks and recognized water safety rules. Most of them reported that they 'cannot swim' and only the minority of respondents reported that they are able to swim (> 200 meters) and they were considered as swimmers. While boys reported better swimming ability, girls reflected better practices and behaviour in drowning prevention.

However, drowning remains a significant factor contributing to fatalities among children and adolescents, ranking as one of the top five causes of child and adolescent mortality in Malaysia. Notably, boys exhibit a 3.5 times higher vulnerability to drowning compared to girls (Farizan et al., 2020). Contrary to earlier research suggesting a sex disparity in water safety knowledge (Moran & Wilcox, 2013; Abelairas-Gomez et al., 2019), the findings from this study reveal a similar level of awareness among girl and boy adolescent students regarding drowning dangers identification and water safety tasks and rules. This result contradicts the report from an earlier study by Moran (2008), which highlighted a lack of water safety knowledge among males (16-45 years old) in Asian immigrants 'as new New Zealanders.

While, it is emphasized that it was not possible to verify the higher level of the participants swimming ability, the study self-reported data revealed that boys' participants had higher swimming and floating abilities, a substantial 83% of respondents (encompassing both sex) reported a lack of swimming ability. Further analysis reflected that 57% of the students posited the inability to swim, while 26% estimated that they could swim less than 50 meters. Prior studies have utilised a distance of 50 meters as a standard for categorising individuals as non-swimmers (Moran, 2008). Therefore, 73% of boy students and 94% of girl students in the present study can be categorised as non-swimmers.

While a study involving Latino children (3-14 years old) indicated that acquiring swimming skills might decrease the risk of drowning (Chung et al., 2014; Olaisen et al., 2018) asserted that boys with higher swimming competency had a higher incidence of drowning cases. Moran (2006) analysed the swimming ability by sex among New Zealand Beachgoers and found that girls demonstrated a higher ability to swim less than 25 meters compared to boys (25%, vs. 15%), while the latter claimed proficiency in swimming over 400 meters (23% vs. 14%). Despite both sexes demonstrating improved swimming ability, their findings align with the present result based on the disparities (Moran,

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2006). While most studies emphasised men's superior swimming competency, Stallmen et al. (2017) reported that young adult men were more likely to self-report strong swimming skills and underestimate drowning risk. Conversely, girls and those with lower self-estimated swimming competence exhibited a high perception of drowning risk and a greater tendency towards risk aversion. Notably, male parents estimated that females aged 5-9-year-olds were more likely to have no risk of drowning compared to males (37% vs. 18%) (Stallman et al., 2017).

In a study on adolescents in a European city (with 800,000 inhabitants) by Rajman et al. (2020), sex differences in self-assessment of swimming skills were observed among children aged 14 to 15 years old. Although both sexes were categorised as low-skilled swimmers, the difference in swimming ability was not statistically significant, with both covering the same distance in trials. Girls are more aware of their swimming ability, which makes it likely for them to anticipate the risks involved. Boys, on the other hand, are typically more daring and underestimate their skills (Rejman et al., 2020; Tipton et al., 2021). Girls also appear more open to learning from practical challenges and reflected a higher performance in swimming activities. These findings diverge from the present study, as male secondary school students exhibited superior swimming ability.

This study also explored adolescents' prevention behaviour, where girl students adopted safety practices and personal responsibility relative to boy students. Adolescent girls in the present study exhibited stronger adherence to safety practices, particularly when engaging in unsupervised swimming, swimming in restricted areas, and swimming in locations with unknown water depth, indicating a lower risk of drowning. Nonetheless, both sexes demonstrated similar compliance with ignored safety directions and lifejackets in boats, with the majority of respondents always paying attention to these safety measures.

Malaysian students, as a part of Asian students' demographics, demonstrated better drowning prevention behaviour compared to a previous study in which Asian students were less likely to engage in essential safety preparation on boats (Moran, 2008). Conversely, boys tend to engage in risky behaviour, emphasizing the need for aquatic education to focus on self-reflection to instil long-lasting responsibility based on their swimming skills (Birch et al., 2022; Rejman et al., 2020). Despite the general perception that males are at a higher risk of drowning, females from migrant communities, particularly those participating in water safety programs, can serve as a conduit for promoting water safety in their families and communities (Willcox-Pidgeon et al., 2021). Teichman et al. (2023) revealed a significant improvement in water safety knowledge and behaviour among elementary and high school students, irrespective of sex, thus emphasising the potential life-saving impact of enhanced education for a vulnerable population (Teichman et al., 2023). Similarly, a study in the USA reported a decrease in life jacket use among adolescents (13–19-year-olds) from 2003 to 2010. Although the overall life jacket use was low (30.7%) and no significant difference was observed between sexes, life jackets were not worn by a significant percentage of boys who died in boating-related incidents (Chung et al., 2014).

In a comparative assessment of lifejacket use among boaters, Leavy et al. (2023) highlighted the availability and regulation of lifejacket use as a critical and cost-effective approach to drowning prevention in New Zealand, Victoria, and Australia. Statistically, no significant increment was detected in the odds of personal flotation device use between the groups, sex and all age groups. Nevertheless, the odds of personal flotation device wear increased significantly among adolescents (Leavy et al., 2023). Gupta et al. (2020) investigated the feasibility of sex transformative strategies in a community-based drowning prevention initiative in Bangladesh. The study highlighted the adherence to traditional sex norms, as women were tasked with domestic responsibilities and childcare (Gupta et al., 2020). Nonetheless, instigating behavioural changes proves challenging in inaccessible populations. Communities that are culturally and linguistically diverse possess a variety of values, practices, and attitudes, which necessitates additional resources for awareness campaigns to be effectively implemented (Birch et al., 2022; Gómez-Paniagua et al., 2024). Despite limited evidence on assessing poor risk judgment, several studies asserted that males experience a higher risk of drowning compared to females, hence overestimating their swimming ability and underestimation of risk (Baset et al., 2012; Olaisen et al., 2018; Willcox-Pidgeon et al., 2021). A vital component in addressing the risk of drowning among this vulnerable population is raising community awareness of proper drowning rescue and resuscitation techniques (Hossain et al., 2022).

In light of past evidence and the present research findings, prioritizing water safety awareness and swimming ability is key to mitigating drowning risks among adolescents (Sánchez-Lastra et al., 2020). These preventive measures align with earlier studies attributing the recent decline in drowning incidence to enhanced swimming skills across different communities. While communities have successfully reduced drowning rates by improving swimming abilities with a focus on sex equity, it is important to consider the potential cultural impact on future sex-related drowning risk behaviour among boys. This suggestion is crucial, especially if girls lead in improving their swimming abilities. Apart from recognizing the potential influence of females' swimming proficiency on reducing future drowning incidents in a family, it is pertinent to emphasise these strategies in educational and cultural programs within schools.

Conclusion

This study revealed comparable water safety awareness levels among female and male secondary school students, with adolescent boys exhibiting higher swimming abilities

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compared to girls. In addition, girls reflected better practices and behaviour in drowning prevention. These findings highlight that in order to reduce the risk of drowning during aquatic activities, the adolescent girls need to improve swimming abilities, while the adolescent boys should focus on enhancement of their drowning behaviour. Although swimming ability offers great possibilities to reduce the risk of drowning, it is essential to consider sex equity in educational programmes and focus on drowning prevention behaviour among boys. This study has limitation in terms of study population. The findings were derived from the responses of Malaysian adolescents in secondary schools and specific to this population. Notwithstanding, this study established baseline data on water safety awareness, swimming ability, and drowning behaviour during swimming or aquatic activities. These findings can assist educational policies in acquiring accurate knowledge about adolescents to develop effective lifelong education programmes. Despite acknowledging the limitation of self-reported water safety awareness, further investigations are warranted to address the limitations associated with self-reported water safety measures. These findings constitute the initial evidence of water safety awareness, swimming ability, and drowning prevention among Malaysian adolescents.s

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