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Psychological Symptoms and Behavioral Risk Factors Associated With Unintentional Injuries Among Hospitalized Children and Adolescents in Ghana

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Abstract

Background and objective: Unintentional injuries in children and adolescents continue to rise and contribute to deaths among children and adolescents every day worldwide. Despite improvements in trauma care, many children and adolescent survivors of unintentional injuries experience persistent psychosocial impairment long after physical recovery. In Ghana, non-fatal unintentional injuries consistently account for a high number of hospital admissions among children and adolescents. Unintentional injuries, related psychological symptoms, and behavioral risk factors associated with unintentional injuries remain largely unexplored among children and adolescents. This study's purpose was to assess the psychological symptoms, such as post-traumatic stress disorder (PTSD) symptoms, depression symptoms, quality of life, and behavioral risk factors associated with unintentional injuries among children and adolescents.

Design and methods: Using a cross-sectional design, a purposive sample of 70 hospitalized children and adolescents aged eight to 17 years with unintentional injuries from transport, burns/fire, falls, drowning, and poisoning was selected from the accident and emergency departments of two major trauma hospitals in the central region of Ghana. Binary logistic regression and Fisher's Exact Test were used to analyze the data.

Results: Unintentional injuries were associated with PTSD symptoms in children and adolescents. The odds of PTSD symptoms in hospitalized children and adolescents with internal physical injuries (drowning and poisoning) were 91% lower than the odds among those with external physical injuries (burns/fire, transport, and falls) (OR= 0.09, 95% CI 0.02-0.46, model X2 (3) = 11.304, $p < 0.010$). Cox & Snell and Nagelkerke pseudo-R^2 values were 0.149 and 0.223, respectively. Also, unintentional injuries in children and adolescents were associated with depression symptoms (Fisher exact test = 27.065, $p < 0.001$) and impaired health-related quality of life (Fisher exact test = 9.789, $p < 0.031$). The top four unintentional injury-related risky behaviors were running into the street (20%, n= 14), selling carelessly on the streets (17.0%, n=12), playing with fire (16.0%, n=11), and playing with electrical appliances or naked wires (14.0%, n=10), respectively.

Conclusions: Unintentional injuries in children and adolescents were associated with post-traumatic stress symptoms, depression symptoms, and impaired health-related quality of life. Children and adolescents' risky behaviors may increase the risk of unintentional injuries. Given this background, further work is needed to understand how behavioral risk factors can be used to reduce the risk of unintentional injuries. It is imperative to integrate psychological screening into the care of children and adolescents with unintentional injuries to address the short- and long-term psychological problems faced by unintentional injury victims. Furthermore, in resource-limited settings such as Ghana, behavioral risk assessment and psychological screening are essential for identifying behavioral risk factors and psychological symptoms early, enabling timely support.

Categories: Psychiatry, Pediatrics, Epidemiology/Public Health
Keywords: behavioral risks, children and adolescents, depression, post-traumatic stress, psychological symptoms, unintentional injuries

Introduction

Every day, on the busy streets, in homes, and in recreational settings in Ghana, a child or adolescent is hit by a speeding vehicle or motorbike or sustains unintentional injuries and suffers not only physical pain and injuries but also lifelong psychological struggles and disabilities after the physical injuries heal. More than 5 million individuals die annually from injuries globally, and about 5,000 deaths in children and adolescents

occur daily [1]. An estimated 1.5 million children and adolescents aged 10 to 24 years died in 2020 from injuries. Unintentional injuries are a subset of injuries without evidence of a predetermined intent [2]. Additionally, unintentional injuries include road traffic injuries (RTIs), drowning, burns/fire, and falls among children and adolescents. Furthermore, unintentional injuries remained the leading cause of death and disability among children and young adults [3]. Pediatric injuries are the top causes of mortality, morbidity, disability, and socio-economic burden [4]. In 2019, road traffic incidents claimed the lives of over 100,000 teenagers (13 to 19 years old) globally [5]. In Sub-Saharan Africa, unintentional pediatric injuries are a heavy burden, with an incidence of 300,257 to 17,479,262 cases annually and contributing to 18, 000 to 30,000 deaths annually in children [6]. In many African countries, including Ghana, little attention is devoted to unintentional injuries in children and adolescents because of greater attention paid to widespread infectious diseases and nutritional deficiencies [7].

In Ghana, the prevalence of unintentional injuries (once or multiple times) among adolescents was 57.0% in 2020. In the study, falls, being hit by an object, and motor vehicle accidents were the most frequently reported causes of serious injury [8]. A study conducted at the Cape Coast Teaching Hospital in Ghana reported that 17.6% of injury-related deaths occurred among children and adolescents aged 16 years and below from 2012 to 2018 [9]. Additionally, a study conducted at the Korle-Bu Teaching Hospital (Accra, Ghana) showed that injury-related deaths accounted for 17% of all autopsies performed on adolescents (10 to 19 years) between 2001 and 2003 [10]. Along with this, the two leading causes of injury-related death were road traffic injuries and drowning [9]. These studies focused on prevalence, mortality, socio-economic burden, and types of unintentional injuries but failed to address the psychological problems and behavioral risk factors associated with unintentional injuries.

Despite rising incidence rates, morbidity, disability, and mortality from unintentional injuries among children and adolescents, the psychological symptoms and behavioral risk factors associated with unintentional injuries remain a largely unexplored public health problem in today's Ghana. This gap in the literature is what the current study aims to address by assessing the psychological symptoms and behavioral risk factors associated with unintentional injuries. The purpose of the study was to assess the psychological symptoms and behavioral risk factors associated with unintentional injuries among children and adolescents aged eight to 17 years at the trauma departments of the two major trauma hospitals in the Central Region of Ghana.

Materials And Methods

Study design and participant characteristics

The study used a quantitative cross-sectional design. The inclusion and exclusion criteria for the study are shown in Table *1*. The inclusion criteria were hospitalized children and adolescents aged eight to 17 years at the pediatric wards of the two selected hospitals in the Central Region of Ghana; hospitalized patients with transport, burns/fire, falls, drowning, and poisoning-related injuries aged eight to 17 years; and children and adolescents admitted to the pediatric trauma department of the selected hospitals, with parents or guardians consenting to participate in the study. Exclusion criteria included children aged less than eight years and hospitalized patients more than 17 years old; hospitalized patients exposed to intentional injuries, including suicide and physical assault; hospitalized patients in an unconscious state with severe head trauma, concurrent psychotherapy, psychopharmacological treatment started, severe mental disorder, or previous psychiatric diagnosis; and participants and their parents or guardians not willing to participate in the study.

Inclusion criteria	Exclusion criteria
Children and adolescents aged eight to17 years	Children aged less than eight years and inpatients older than 17 years
Exposed to unintentional injuries, including transport-related injuries. burns/fire, falls, drowning, and poisoning	Exposed to intentional injuries, including suicide and physical assault
Admitted to the pediatric trauma department of the selected hospitals	Admitted to the pediatric trauma department and in an unconscious state, severe head trauma, concurrent psychotherapy, psychopharmacological treatment started, severe mental disorder, previous psychiatric diagnosis
Participants and their parents or guardians must consent to participate in the study	Participants and their parents or guardians not willing to participate in the study

TABLE 1: Inclusion and exclusion criteria

Sampling procedures

The sample comprised hospitalized children and adolescents with unintentional injuries (transport, burns/fire, falls, drowning, and poisoning) aged eight to 17 years. The sample was obtained by purposively selecting all hospitalized patients with transport, fire/burns, falls, drowning, and poisoning-related injuries aged between eight and 17 years in the pediatric wards of two selected hospitals in the Central Region of Ghana. The lower age limit of eight years was selected because of the age range of the Trauma Symptom Checklist for Children (TSCC) [11] and was informed by a review of related literature on unintentional injuries. The two hospitals were selected because one is the largest teaching and referral hospital for trauma cases, and the other is one of the largest metropolitan hospitals in Ghana's central region.

Sample size

A power analysis was conducted for an effect size of 0.41, $\alpha = 0.05$, power = 0.80, and 4 degrees of freedom (df) using G*Power version 3.1, based on the chi-square test of association. The required sample size was 72 participants. To account for potential incomplete responses and non-responses, an additional 10% was added, resulting in a total of 79 participants for the baseline sample.

Data collection procedures

Two trained research assistants were selected from pediatric wards. Each research assistant was a senior staff nurse at the pediatric ward of each hospital in the central region of Ghana. A date and time were agreed upon by the two senior staff nurses and the researcher. Two days were used by the researcher to train the research assistants on the data collection instrument. Each research assistant was involved in discussing the aims of the research with the parents and inpatients. Informed consent was obtained from parents and their children. The recruitment of participants lasted for three months.

Measures

Three data collection instruments were merged into a single questionnaire and used to collect data for the study. These were the TSCC, Injury Behavior Checklist (IBC) [12], and Pediatric Quality of Life Inventory (PedsQL 4.0 Generic Core Scales) [13]. Permission was obtained for the use of the data collection instruments. The questionnaire was administered 72 hours post-trauma for newly admitted patients to ensure they were medically stable and 72 hours to four weeks post-trauma for already admitted patients. Questions from research participants about items on the questionnaire were answered in clear and simple language. Questionnaires were completed in 40 to 60 minutes. The researchers collected data, and two pediatric nurses were trained to assist with data collection from March to May 2021. The data collection lasted three months.

The TSCC was developed by [11] to assess trauma-related symptoms in children and adolescents aged eight to 17 years who have experienced traumatic events. The instrument has been used in both clinical and non-clinical settings. The checklist includes six clinical subscales: anxiety, depression, post-traumatic stress, sexual concerns, dissociation, and anger. The TSCC is a 54-item self-report questionnaire that takes approximately 15 to 20 minutes to administer. Items are rated on a 4-point Likert-type scale ranging from 0 to 3, where 0 = 'never,' 1 = 'sometimes,' 2 = 'lots of times,' and 3 = 'almost all the time.' Raw scores obtained from patients' reports were converted to T scores. The T scores ranged from $\leqslant 35$ to $\geqslant 110$. On the TSCC, T scores equal to or greater than 65 indicate clinically problematic symptoms (PTSD and depression symptoms) [11]. For this study, the post-traumatic stress and depression subscales were selected due to their relevance in assessing the psychological symptoms of unintentional injuries in hospitalized children and adolescents. The post-traumatic stress subscale consists of 10 items assessing post-traumatic stress symptoms following unintentional injury, while the depression subscale consists of 9 items assessing depressive symptoms in this population. The instrument demonstrates strong psychometric properties, with internal consistency reliability (Cronbach's alpha) of 0.89 for the clinical scales and 0.84 for the total scale from previous studies. The TSCC used for children and adolescents reported concurrent validity with other instruments measuring similar constructs. For this study, the instrument has internal consistency (Cronbach's alpha) of 0.64 for the post-traumatic stress subscale and 0.67 for the depression subscale.

The IBC was developed to assess specific risk-taking behaviors in children [12]. The instrument evaluates behaviors that contribute to the risk of childhood injuries. The IBC has been used in both clinical and non-clinical settings. It consists of 24 items describing specific risk-taking behaviors, with each item rated on a 5-point Likert-type scale ranging from 0 to 4. The items from the IBC related to transport- and burns/fire-related injuries, as well as specific risk-taking behaviors, were selected because the study focused on unintentional transport, burns/fire, falls, drowning, and poisoning injuries in children and adolescents. The adapted IBC includes 11 items describing specific risk-taking behaviors. Each item is rated on a five-point Likert-type scale ranging from 0 to 4, where 0 = 'not at all,' 1 = 'very seldom,' 2 = 'sometimes,' 3 = 'often,' and 4 = 'very often.' The instrument demonstrates strong psychometric properties, with an internal consistency reliability coefficient of 0.87 and a test-retest reliability coefficient of 0.81. For this study, the instrument has internal consistency (Cronbach's alpha) of 0.85. Evidence of validity indicates that the IBC significantly discriminates between children with two or more injuries and those with no injuries ($p < .001$). Additionally, construct-related evidence of the questionnaire was obtained through pilot testing of the instrument. The final instrument for the study was created after all corrections to the questionnaire were made following the pilot testing.

Pediatric Quality of Life Inventory was developed by Varni et al. [13]. The instrument is used to measure health-related quality of life in children with acute and chronic health conditions. It is used in clinical, school, and community settings for children. The child self-report type of the PedsQL was used to collect data for this study. The instrument is made up of 23 items. It has four scales: physical, emotional, social, and school functioning. Items were reverse-scored and linearity transformed to a 0 to 100 scale; higher scores indicate better quality of life. The total scale score has a reliability of 0.90. Items on the PedsQL are structured on a 5-point Likert-type scale. Scale points range from 0 to 4. Each item is rated on the Likert-type scale as 0 = 'never,' 1 = 'almost never,' 2 = 'sometimes,' 3 = 'often,' and 4 = 'almost always.'

Data analysis

Data computation and analysis were done using SPSS Statistics version 31 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including absolute frequency and percentage, were used for demographic variables such as age, sex, level in school, occupation of parents, parents' education, and type of injury. For analysis, unintentional injuries were classified as internal physical injuries (drowning and poisoning) and external physical injuries (burns/fire, transport, and falls). This classification was adopted to facilitate analysis since injuries have traditionally been considered as damage to a person caused by an acute transfer of energy (mechanical, thermal, or electrical) or by the sudden absence of heat, oxygen, or a systemic non-mechanical injury as part of disease or trauma control priorities in developing countries [14]. Both PTSD and depression symptoms were coded as 1 = score ⩾65 and 0 = score <65, with score <65 as the reference. Quality of life symptoms were coded as 1 = score ⩾70 and 0 = score <70, with a score <70 as the reference. For categorical predictor variables, level in school was coded as 1 = junior high school (JHS) and 0 = primary, with primary as the reference, and parental occupation was coded as 1 = level 2 and 0 = level 4, with level 4 as the reference, based on the International Standard Classification of Occupations 08 (ISCO-08) [15]. Unintentional injuries were coded as 1 = internal physical injuries (drowning and poisoning) and 0 = external physical injuries (burns/fire, transport, and falls), with external physical injuries as the reference.

To assess statistical significance, binary logistic regression was used for research hypothesis 1, and $p<0.05$ was considered statistically significant. Binary logistic regression was used because the dependent variable (PTSD) was a binary categorical outcome variable (presence of PTSD symptoms = 1, absence of PTSD symptoms = 0). The maximum value of the dependent variable was PTSD symptoms = 1, with absence of PTSD symptoms as the reference. The OR was estimated to determine the odds of children and adolescents experiencing PTSD symptoms. Cox & Snell and Nagelkerke pseudo-R^2 values were used. Fisher's exact test was used to assess the association between unintentional injuries and depression symptoms and between unintentional injuries and quality of life, with $p<0.05$ considered statistically significant. Continuous behavioral risk factors were summarized using frequencies and percentages.

Ethical considerations

The Cape Coast Teaching Hospital Ethical Review Committee provided approval to conduct the research (approval no. CCTHERC/EC/2021/115). The rights of research participants were respected. Written informed consent was obtained from parents, and children and adolescents gave informed assent. before data collection commenced. Confidentiality and privacy were maintained throughout the study. The purpose of the study was explained to respondents and their parents, with no compulsion placed on their participation.

Results

Participant recruitment process

Of the 79 hospitalized children and adolescents and unintentional injury survivors contacted, nine parents/children and adolescents declined participation, and only 70 children and adolescents and their parents agreed to participate in the study (Figure *1*).

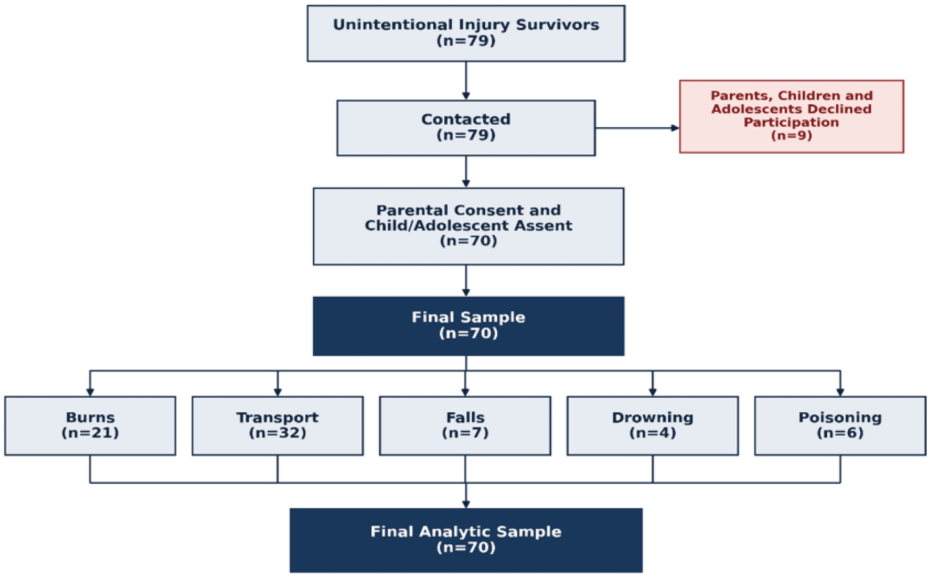

FIGURE 1: Flow diagram charting the recruitment of participants

Demographic characteristics of patients

Table *2* presents the demographic characteristics of patients (total n = 70). The majority of the respondents (44%, n = 31) were within the age range of 11 and 13 years, followed by 34% (n = 24) in the range of 14 and 17 years, while the remaining 21% (n = 15) were between eight and 10 years, with a mean age of 12.46 ± 2.19 years. Most respondents (56%, n = 39) were males, while 44% (n = 31) were females. The majority of the respondents (61%, n = 43) were in JHS, whereas 39% (n = 27) were in primary school. More than half of the parents (53%, n = 37) were traders, followed by teachers (20%, n = 14), and farmers (13%, n = 9). Most parents (29%, n = 20) had completed JHS, 27% (n = 19) had completed senior high school (SHS), and 20% (n = 14) had completed university. Transport injuries accounted for the highest proportion (45.7%, n = 32) among the respondents. This was followed by burns/fire (30%, n = 21), falls (10%, n = 7), poisoning (8.6%, n = 6), and drowning (5.7%, n = 4).

Variable		Frequency	Percentage
Age (years)	Eight to 10	15	21.0
	11 to 13	31	44.0
	14 to 17	24	34.0
Sex	Male	39	56.0
	Female	31	44.0
Level in school	Primary	27	39.0
	JHS	43	61.0
Occupation of parents	Hair dressing	2	3.0
	Trading	37	53.0
	Plumbing	2	3.0
	Engineering	2	3.0
	Teaching	14	20.0
	Farming	9	13.0
	Tailoring	4	6.0
Parent's education	JHS	20	29.0
	SHS	19	27.0
	Training college	11	16.0
	Polytechnic	6	9.0
	University	14	20.0
Type of injury	Burns/fire	21	30.0
	Transport	32	45.7
	Falls	7	10.0
	Drowning	4	5.7
	Poisoning	6	8.6

TABLE 2: Demographic characteristics of patients (total n = 70)

JHS: Junior high school, SHS: Senior high school

PTSD symptoms and the binary logistic regression of unintentional injuries, parental occupation, and level of education

Binary logistic regression revealed that unintentional injuries were associated with PTSD symptoms in children and adolescents (Table 3). The odds of PTSD symptoms in hospitalized children and adolescents with internal physical injuries (drowning and poisoning) were 91% lower than the odds among those with external physical injuries (burns/fire, transport, and falls) (OR = 0.09, 95% CI 0.02-0.46, model X2 (3) = 11.304, $p < 0.010$). One possible explanation could be the visible physical injuries in external physical injuries (burns/fire, transport, and falls), which serve as reminders of the unintentional traumatic injuries and subsequent PTSD symptoms. Cox & Snell and Nagelkerke pseudo-R^2 values were 0.149 and 0.223, respectively. Based on the non-significant Hosmer-Lemeshow goodness-of-fit p-value (sig = 0.576), there was no evidence of poor model fit. Based on the results below, the logistic regression equation was In(Odds) = 1.38 − 2.40 (unintentional injuries) + 0.94 (parental occupation) − 0.71 (education level in school). However, level in school of respondent (p = 0.302) and occupation of parents (p = 0.150) were not statistically significant predictors of the odds of participants having PTSD symptoms.

Variable	B(standard error (SE))	Wald	df	Significant	95% CI for OR		
					Lower	Exp(B)	Upper
Constant	1.38(0.67)	4.28	1	0.039		3.97	
Unintentional injuries	-2.40(0.82)	8.49	1	0.004	0.02	0.09	0.46
Parental occupation	0.94(0.65)	2.07	1	0.150	0.71	2.55	9.12
Level in school	-0.71(0.69)	1.06	1	0.302	0.13	0.49	1.90

TABLE 3: Binary logistic regression of unintentional injuries, parental occupation and education level in school on PTSD symptoms

R^2 = 0.15 (Cox & Snell R2), .022(Nagelkerke R^2), 66.31(-2Log Likelihood), model χ^2 (3) = 11.304, p < 0.010

PTSD: Post-traumatic stress disorder, SE: Standard error, df: Degrees of freedom

Fisher’s exact test of association between unintentional injuries and depressive symptoms

Among 21 burn participants, 19.0% reported no depressive symptoms, and 81.0% had depressive symptoms. Among 32 transport-injured participants, 37.5% had no depressive symptoms, and 62.5% had depressive symptoms. Of the seven participants who suffered falls, 100.0% had no depressive symptoms. Among the four participants with drowning, 100.0% had no depressive symptoms. Among the six participants with poisoning, 100.0% had no depressive symptoms. Since the Pearson chi-square showed five cells had an expected count <5, Fisher's exact test was used. As the result of Fisher's exact test indicated, there is an association between unintentional injuries and depressive symptoms (Table *4*), which was statistically significant (Fisher's exact test = 27.065, p < 0.001).

Variable (type of injury)	Depressive symptoms		Fisher’s exact test	p-value
	No, n (%)	Yes, n (%)		
Burns/fire	4 (19.0)	17 (81.0)	27.065	<0.001
Transport	12 (37.5)	20 (62.5)		
Falls	7 (100.0)	0 (0.0)		
Drowning	4 (100.0)	0 (0.0)		
Poisoning	6 (100.0)	0 (0.0)		

TABLE 4: Fisher’s exact test of association between unintentional injuries and depressive symptoms

Fisher’s exact test of association between unintentional injuries and health-related quality of life outcomes

Among 21 burns/fire participants, 57.1% reported no impaired health-related quality of life symptoms, and 42.9% had impaired health-related quality of life symptoms. Among the 32 transport-injured participants, 40.6% reported no impaired health-related quality of life symptoms, and 59.4% had impaired health-related quality of life symptoms. Of the seven participants who had suffered falls, 100.0% reported impaired health-related quality of life symptoms. Among the four participants who experienced drowning, 100.0% reported impaired health-related quality of life symptoms. Among six participants affected by poisoning, 33.3% reported no impaired health-related quality of life symptoms, and 66.7% had impaired health-related quality of life symptoms. Since the Pearson chi-square result showed five cells had an expected count <5, Fisher's Exact Test was used. The results of Fisher's exact test indicated that there is an association between unintentional injuries and impaired health-related quality of life symptoms (Table *5*), which was statistically significant (Fisher exact test = 9.789, p < 0.031).

Variable (type of injury)	Quality of life outcomes		Fisher's exact test	p-value
	No, n (%)	Yes, n (%)		
Burns/fire	12(57.1)	9(42.9)	9.789	0.031
Transport	13(40.6)	19(59.4)		
Falls	0(0.0)	7(100.0)		
Drowning	0(0.0)	4(100.0)		
Poisoning	2(33.3)	4(66.7)		

TABLE 5: Fisher's exact test of association between unintentional injuries and health-related quality of life outcomes

Behavioral risk factors among children and adolescents with unintentional injuries

The top four unintentional injury-related risky behaviors were running into the street (20%, n = 14), selling carelessly on the streets (17%, n = 12), playing with fire (16%, n = 11), and playing with electrical appliances or naked wires (14%, n = 10), respectively (Table 6). The least unintentional injury-related risky behaviors were playing while crossing the street (9%, n = 6), behaving carelessly in or around hot water (7%, n = 5), coming into contact with hot objects (4%, n = 3), riding a bike in unsafe areas (4%, n = 3), refusing to use a seat belt (3%, n = 2), riding a bicycle without a helmet (3%, n = 2), and refusing to look left-right-left (3%, n = 2).

Variable	Frequency	Percentage
Runs into the street	14	20.0
Rides bike in unsafe areas	3	4.0
Plays with fire	11	16.0
Plays with electrical appliances or naked wires	10	14.0
Refuses to use the seat belt	2	3.0
Comes into contact with hot objects	3	4.0
Behaves carelessly in or around hot water	5	7.0
Sells carelessly on the streets	12	17.0
Plays whiles crossing the street	6	9.0
Rides bicycle without helmet	2	3.0
Refuses to look left-right-left	2	3.0

TABLE 6: Behavioral risk factors among children and adolescents with unintentional injuries

Discussion

This study is among the first to assess the psychological symptoms and behavioral risk factors associated with unintentional injuries among hospitalized children and adolescents in Ghana. It found that unintentional injuries were significantly associated with post-traumatic stress symptoms, depression symptoms, and impaired health-related quality of life in hospitalized children and adolescents.

The study's findings are consistent with other studies from Australia and Zurich in Switzerland reporting that children experience depression and post-traumatic stress symptoms after unintentional injuries [16,17]. These findings are also corroborated by studies that have documented the psychological problems associated with unintentional injuries, such as post-traumatic stress, anxiety, depression, and emotional and

behavioral problems among children and adolescents [18-20]. Additionally, the study findings concur with the findings of most studies that road traffic injuries are linked to PTSD, depression, psychological distress, impaired autonomy, cognitive maladaptation, impaired quality of life [21-23], and reduced productivity, poor performance, and impaired social relationships [24]. Several studies found an association between road traffic accidents and PTSD symptoms [24-26]. In contrast, a study conducted in Dresden, Germany [27] reported no psychological disorders, including depression, anxiety, and somatization symptoms associated with RTIs. The lack of a link between road traffic injuries and psychological disorders could be attributed to the use of different measurement tools.

This study's results show that all respondents engaged in preventable behaviors that can ultimately reduce the risk of unintentional injuries. Furthermore, the top four unintentional injury-related risky behaviors were running into the street, selling carelessly on the streets, playing with fire, and playing with electrical appliances or naked wires, respectively. Previous studies have also shown that reducing risky behaviors, such as using burn devices like ovens and electric kettles, may significantly reduce or prevent unintentional injuries. A study conducted in Washington, USA reported that behavior change reduces unintentional injury risk in children [28], and a study conducted in Kolkata, India stated that obeying traffic regulations while crossing the road and reducing the frequency of walking on the road minimizes unintentional injuries in children and adolescents [29]. Furthermore, in resource-limited settings such as Ghana, behavioral risk assessment and psychological first aid in discharge protocols will help prevent unintentional injuries and identify psychological symptoms for timely support for children and adolescents.

Strengths and limitations

This study has several strengths. First, this study is among the first to assess the psychological symptoms and behavioral risk factors associated with unintentional injuries among children and adolescents in Ghana. Second, it was conducted in different pediatric trauma departments of different hospitals and included a range of unintentional injuries (burns/fire, transport, falls, drowning, and poisoning). Third, the accuracy of psychological outcomes was improved, and potential confounding was minimized by excluding hospitalized patients in an unconscious state, severe head trauma, concurrent psychotherapy, psychopharmacological treatment started, severe mental disorder, and previous psychiatric diagnosis. Furthermore, standard instruments were used to measure outcomes of unintentional injuries to ensure the reliability and validity of the findings.

However, our study has several noteworthy limitations. First, the cross-sectional nature means it is not possible to determine the causality and directionality of the relationships between unintentional injuries and adverse psychological outcomes. Second, the cross-sectional design could have led to some patients with unintentional injuries and PTSD symptoms being missed. Third, there is a potential for selection bias given that this study was based on hospitalized children and adolescents at the pediatric trauma departments of the hospitals. Thus, the study results may not be generalizable to the broader inpatient population with unintentional injuries and non-hospitalized unintentionally injured children and adolescents. Also, the reliance on self-reported data could introduce potential recall and social desirability biases. Fourth, psychological symptoms of unintentional injuries were assessed using validated self-reported measures, and this may have introduced reporting bias. Finally, the sample size was relatively small, and the purposive sampling strategy was not based on a random selection of the sample, limiting the generalizability to the broader population of unintentionally injured children and adolescents.

Conclusions

Unintentional injuries in children and adolescents were associated with post-traumatic stress symptoms, depression symptoms, and impaired health-related quality of life. Children and adolescents' risky behaviors may increase the risk of unintentional injuries. Given this background, further work is needed to understand how behavioral risk factors can be used to reduce the risk of unintentional injuries. It is imperative to integrate psychological screening into the care of children and adolescents with unintentional injuries to address the short- and long-term psychological problems faced by unintentional injury victims. Furthermore, in resource-limited settings such as Ghana, behavioral risk assessment and psychological screening are essential for identifying behavioral risk factors and psychological symptoms early to enable timely support.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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Critical review of the manuscript for important intellectual content: Frank Agyapong, Maha Albdour, Hossein Yarandi

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. Cape Coast Teaching Hospital Ethical Review Committee issued approval CCTHERC/EC/2021/115. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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