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A Cross-Sectional Survey of Unintentional Injuries Among 15-24-Year-Old Vocational School Youth From Pakistan Between 2021-2022

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Abstract

There is a lack of recent data on the incidence of unintentional injuries and occupational injuries from Pakistan, among youth 15 to 24 years of age. This survey was conducted among vocational school youth in Peshawar, Pakistan (2021-22). Parental consent and assent were obtained for students < 18 years of age. After obtaining consent, students were given a hard copy of the self-administered, World Health Organization community survey guide for injuries and violence questionnaire in a classroom session. Incidence Rate Ratios (IRR) were reported for unintentional and occupational injuries There were 547 youth of which [356 (54%)] were males. Majority [535 (97%)] of the students had received formal education before vocational training, while fathers had higher formal education [437(80%)], compared to mothers [326 (60%)]. The median family income of these vocational students was 30 000 Pakistani rupee (PKR) per month. Vocational youth mostly lived in crowded family settings with 239 participants (44%) living with ≥8 family members in the household. In terms of risk behaviors, there was minimal use of tobacco [532 (97.3%)] and minimal alcohol [9 (2%)]. Non-use of helmets was found in [273 (50%)], which was similar to seat belt non-use in [307 (56%)] of participants. Eight percent of students carried a gun for personal protection. Males had 3.24 times higher rates of road traffic injuries, 1.28 times higher rates of occupational injuries, and 1.63 times higher rates of unintentional injuries overall compared to their female counterparts. The 15 to 19 age group had significantly lower incidence of burns and falls compared to the 20 to 24 age group. Factors that increased the risk of unintentional injuries UI_T were tobacco use adjusted IRR = 1.25 (95% CI: 1.05-2.69, $P = .049$), not using a seat belt adjusted IRR = 1.3 (95% CI: 1.14-1.69, $P < .001$), lack of formal education prior to vocational training in the youth, adjusted IRR of 4.6 (95% CI: 1.12-18.91, $P = .034$), lack of father's education adjusted IRR = 4.71 (95% CI: 2.12-10.49, $P < .001$), lower family income (≤35 000 PKR) adjusted IRR = 2.04 (95% CI: 1.04-4.02, $P = .039$), larger household size (≥8 members), with an adjusted IRR of 3.59 (95% CI: 3.11-5.07, $P < .001$). In contrast, age ≤ 19 years showed a higher unadjusted risk (IRR = 2.05, 95% CI: 1-4.2, $P = .049$), but this association was not significant after adjustment (adjusted IRR = 1.61, 95% CI: 0.8-3.27, $P = .184$). Marital status and mother's education were not significantly associated with UI_T. This study on vocational youth in Pakistan highlights the critical need for targeted interventions. We recommend prioritizing stricter enforcement of traffic laws, implementing public awareness campaigns specifically for vocational youth, and providing subsidized safety equipment, such as helmets. Furthermore, integrating comprehensive road safety and health education into vocational training curricula is crucial. By addressing these critical areas, significant reduction in injury rates and improved safety and well-being of this vulnerable population may be realized.

Keywords

adolescents, Pakistan, unintentional injuries, youth, occupational injuries

Highlights

- First comprehensive survey on unintentional and occupational injuries among Pakistani youth (15-24 years) in vocational schools.
- Males are disproportionately affected: 3.24 times higher road traffic injuries, 1.28 times higher occupational injuries, 1.63 times higher overall unintentional injuries.
- Critical risk factors include non-use of seat belts (IRR=1.3), lack of youth's prior formal education (IRR=4.6), low father's education (IRR=4.71), and large household size (IRR=3.59).
- Urgent recommendations for targeted interventions, including enhanced traffic safety, public awareness, and safety education integration.

Introduction

Unintentional injuries are a significant cause of morbidity and mortality in youth.[1-5] In 2019, unintentional injuries resulted in 0.3 million deaths and 31 million disability-adjusted life years (DALYs) in 10 to 24-year-old youth.[1] This reflects 25% of deaths and 14% of DALYs in 2019 are attributed to unintentional injuries.[1] Unintentional injury deaths in adolescents in South Asia and Sub-Saharan Africa are quite high.[6] In 2017, out of the 0.7 million estimated global injury-related deaths among adolescents, roughly 0.13 millions of these injury deaths occurred in the Eastern Mediterranean Region.[3] This trend is further reflected in age specific patterns with adolescent and youth deaths in the age groups of 15 to 19 and 20 to 24 years being related to being riders or drivers, whereas in those 10 to 14 years it was related to being pedestrians.[7] Road traffic injuries (RTIs), drownings, poisoning, and falls are higher among males, while burns tend to be higher in females.[6] Hence, the complex patterns yield the high burden of unintentional injuries in low-middle-income countries among youth making it a major public health issue.[2-5]

Pakistan has a population of 216.6 million of which 19.4% are youth aged 15 to 25 years.[8] Pakistan has shown a 32% overall decline in injury mortality with a death rate of 36 per 100 000 population in 2017.[3] The incidence rate for RTIs in Pakistan from the Global Burden of Disease (GBD) data from 2017 is 528 per 100 000, while prevalence is 1815 per 100 000 which has increased 58% since 1990.[9] Between 1990 and 2000 there were 2 national injury surveys[10,11] in Pakistan. The National Injury Survey of Pakistan (NISP) 1997[10] and National Health Survey of Pakistan (NHSP) 1990-94[11] reported an annual incidence of unintentional injuries in Pakistani youth as 46 per 1000 per year,[10] falls at 22.2 per 1000, road traffic injuries (RTIs) at 17 per 1000, poisonings at 3.3 per 1000, and burns at 1.7 per 1000 in 15 to 30 year old's.[11] A few regional studies between 2000 and 2015 were done in school-age children[12] and hospitals,[13] but ongoing vocational school youth trends remain unexplored. Local studies on falls and drownings in youth are non-existent. A few recent studies focus on falls in the elderly[14,15] and not youth. Studies on poisoning in youth have been sparse and dated, focusing on adolescents and children <20 years.[16,17] Furthermore, occupational injuries, which are high in vocational youth, have not been studied in Pakistan.[18]

Vocational schools enroll many young students which makes them an important setting to study youth.[19] Vocational school youth have lower socioeconomic status (SES) compared to school-based youth.[20] Vocational school youth are known to engage in high-risk behaviors like poor diet, tobacco, alcohol use, helmet nonuse, and seatbelt nonuse which increases their risk for unintentional injuries.[19,21] A strong link between lower SES and unintentional injuries is already shown in the literature.[22] Furthermore, vocational school youth are at a higher risk of occupational injuries because of inexperience.[23] A link between high-risk behavior and unintentional injuries also exists.[24] A 2.46 times higher probability of unintentional injuries in youth with high risk behaviors was reported compared to youth with no high risk behaviors.[24] A 1.07 probability of unintentional injuries is reported in vocational youth with high-risk behaviors.[21] There is a paucity of literature on risk-taking behaviors, unintentional injuries, and occupational injuries in vocational school youth from Pakistan. Approximately 446 000 youth in Pakistan are engaged in vocational learning, the majority being male (67%),[25] yet vocational youth are often neglected and seldom studied.[26-30] In this study, we aimed to determine the incidence, characteristics, and risk factors of unintentional injuries and occupational injuries among vocational youth in Peshawar, Pakistan.

Methods

The reporting guideline for STROBE checklist[31] was followed in this manuscript.

Study Design

A cross-sectional study was conducted among vocational school students using a standard World Health Organization (WHO) questionnaire for injuries and violence[32] to assess the incidence of intentional injuries.

Study Setting

This study took place in Peshawar, which is the largest city of Khyber Pakhtunkhwa (KPK), with an estimated population of 14 million.[33] Khyber Pakhtunkhwa, which is a province in Pakistan, has 39 Technical Vocation and Education Training (TVET) institutes, out of which 4 are located in

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Peshawar city, with approximately 2000 students.[34] This study was conducted at 4 public sector TVET institutes in Peshawar based on their ease of access.[34] Two were in Gulbahar while the other 2 were located in Hayatabad. These urban centers had well-maintained roads and were within an hour's proximity of each other making the centers easily accessible for data collection. The TVET authority regulates the public TVET institutes.[34,35] Only the public TVET centers in Peshawar were included in this study. The private TVET suffer from a decentralized management system due to which it was not possible to include them in this study.

Sample Size

The quantitative sample was calculated based on older national-level survey.[10] This survey was chosen because of its relevance. This survey is older but provides an incidence of injuries in students and youth in Pakistan.[10] Furthermore, this study was conducted at the national level which makes it relevant to this study.[10] We hypothesized that the incidence of unintentional injuries would differ between male and female vocational students. Based on the previous study, we expected a difference of 3%.[10] We calculated a sample of 505 to detect this difference with 80% power and a two-sided alpha of 0.05, using this formula $n = (Z \propto \backslash 2\sqrt{(\mathrm{P\,o}(1-P\mathrm{o})) + Z\beta\sqrt{(Pa(1-Pa)))2}} / (P\mathrm{o}-Pa)2$. A non-response rate of 10% (50) was added to achieve a final sample of 550.

Sampling Strategy

Convenience and quota sampling strategy was used. All participants available in the vocational school on the day(s) of data collection were offered enrollment. To ensure representation of males and females from all centers, a quota sampling technique was used. A minimum quota of 100 females per center and 175 males per center was used to ensure the representation of sexes (from all 4 centers. In total, 565 participants were invited in this study (200 females and 365 males), which yielded 15 non-respondents and 3 exclusions, and a final sample of 547.

Inclusion and Exclusion Criteria

Only students enrolled as full-time in any program over the last 12 months, and between the ages of 15 to 24 years were included. Students who were able to read and write Urdu were included. (Pashtu is a local language but most cannot read or write Pashtu, while 100% of participants could read and write Urdu). Students who could provide written consent/assent or parental consent were included in the study. Consent for participation in the study (18 years and older) and assent (younger than 18 years) were obtained before data collection, this was done by explaining the study's objectives and information sheets before data collection. The information sheet and consent forms were sent home with students requiring assent. In the following 2 to 3 days consent forms were gathered by data collectors and participants were listed for inclusion. If a participant or parent refused consent, they were excluded from data collection.

Data Collection

Data were collected during institution hours (8 am-2 pm). Two data collectors were hired for this study. The principal of each institute was contacted to obtain an hour-long timeslot before data collection. The convenience of the students was kept a priority, and the session was not done during break time or after school hours. During a 1-h class session, a hard copy of the self-administered questionnaire was distributed in-person to classes of between 15 and20 students. Two data collectors guided data collection. Each question and their options were explained to the participants in the classroom session. If a student had any query, the data collectors responded to it directly. Data were collected from students directly, between February 2022 to October 2022.

Variables

Unintentional injury was defined as "any injury which was unintentional for which medical treatment was received at a hospital or a clinic or first aid from his/her mates, teachers, or parents or it was not treated but caused the injured to miss a half day or more of school or regular activities" as defined by Peden et al.[1]

The primary outcome variable was the total injuries count, which was calculated by adding up the individual unintentional injury counts in the previous 12 months (RTI, falls, burns, drownings, poisonings, and occupational injuries).

Educational status for both students and parents were checked through 6 responses as follows Middle (8th), Matric (10th), FSC (12th), Bachelors, Masters, Unknown. Responses were merged to create a binomial variable. All the responses corresponding to various levels of schooling, "Middle, Matric, FSC, Bachelor, Master" were taken as educated. The response, "unknown" was taken as having no education.

The exposures were sex (male/female). Covariates in this study were education (educated vs uneducated), family income (combined income was calculated by adding income of the parent and youth), family size (number of members in household), helmet use in past 30 days (use vs no use), seat belt use in past 30 days (use vs no use), alcohol 6 h before RTI (use vs no use), current tobacco use (use vs no use), gun carrying in past 30 days (yes or no). Each exposure variable was collapsed, and options were merged to create a corresponding binomial variable (yes/no).

Data Collection Instrument

The WHO questionnaire for injuries and violence was adapted for this study (Supplemental Appendix A). The original WHO tool was first published in 2004 as part

of guidelines for conducting injury surveys in community settings.[32] The original WHO questionnaire had 60 questions comprised of sociodemographic, substance use, safety behavior, unintentional injuries, impact of injuries/disabilities, and first aid.[32] The original WHO instrument uses reliable standard terms which ensures the data is valid and reliable.[32] The WHO instrument was designed by injury experts based on "previous experience"; hence, this instrument's face and content validity is already established.[32]

In this study, pilot testing of the questionnaire was conducted on 50 participants based on which modifications were made to the original WHO tool. The 50 participants from pilot testing were excluded from the final analysis. The original WHO questionnaire was modified to include further sections on vocational training (Q 4, Q 5, Q 9, Q 12, Q 13) and occupational injuries (Q 55, Q 56, Q 57, Q 58, Q 59, Q 60; Supplemental Appendix A). Furthermore, questions about counts of RTI, falls, burns, poisonings, and drownings were also included (Q 15, Q 17, Q 15, Q 27, Q 34, Q 42, Q 46, Q 49, Q 52).[36] The modified questionnaire had 81 questions (Supplemental Appendix A). The internal validity of the modified multi-dimensional instrument was checked by repeat testing on 20 participants[37] (Supplemental Appendix B). Those 20 participants filled out the survey at week 1 and week 2.[37] In this sense, each subject served as their own control. Hence variability due to differences in the average responsiveness of the subjects was eliminated. The Cronbach's alpha of the modified questionnaire was calculated as .63 (CI 0.58-0.63) which is considered low to moderate for a multi-dimensional tool.[38] This means that the responses from participants were variable and did not reliably measure the same construct.[38]

Bias and Confounding

Recall bias is an issue in surveys on injuries. Based on injury survey guidelines, a recall period of up to 12 months is considered a safe period for non-fatal injuries.[32] By repeat testing of the modified WHO questionnaire on 20 participants[37] a Pearson Correlation Coefficient was calculated for the responses to questions on injury counts (Q 15, Q 17, Q 27, Q 34, Q 42, Q 46, Q 49, Q 52). A high correlation (0.9-1.0) was noted in the responses to questions about injuries in the previous 12 months while a moderate to low correlation (.44-.88) was noted for the responses to questions about injuries that occurred more than 12 months ago (Supplemental Appendix B). This confirms the reliability of using up to 12 months recall period for non-fatal injuries in this study.[32] Based on literature, each type of injury has different confounders. Since the outcome variable (total unintentional injuries) was computed by combining all unintentional injuries, it was not feasible to check effect modification and confounding for overall injuries.

Statistical Analysis

Stata Corp LLC version 15.1 was used for statistical analysis. Data were cleaned and 3 participants with more than 10% missing data were eliminated. Three participants had missing responses $\geq$2 injury outcome variables. The sample included in the final analysis was 547. Data for total unintentional injuries The data were considered as over-dispersed counts data because of the presence of excessive zeros (0) in outcome variables,[39] due to which Negative Binomial Regression Model (NBRM) was used. All the significant variables in the crude model were included in the final adjusted model. Stepwise forward regression was used. Adjusted IRRs were reported for sex and exposure variables except for marital status which was insignificant. The final model was statistically significant (LR test $P = .003$), meaning the predictors collectively improve the fit compared to a null model.

Results

The descriptive characteristics of vocational youth (Table 1). There were 547 youth, out of which 356 (54%) were males while 191 (35%) were females. Majority of the students had a formal education prior to starting vocational training 535 (97%). A higher number of fathers were educated 437 (80%), compared to mothers 326 (60%). The median family income of vocational students was 30 000 PKR per month. Vocational youth mostly lived in crowned families 239 (44%; $\geq$8 family members in the household). Most of the students 532 (97.3%) did not use any tobacco. Minimum substance (alcohol) use was reported by students 9 (2%). Helmet non-use was reported by 273 (50%) of participants, while seat belt non-use was reported 307 (56%) individuals. Eight percent of students carried a gun for personal protection.

Stratification by Sex

Total unintentional injuries (UI_T) reported were 551, with a breakdown of RTIs 197 (36%), burns 137 (25%), falls 79 (16%), drownings 28 (5%), poisonings 15 (3%), and occupational injuries (Table 2). Females were taken as a reference group in this model, with males having 3.24 times higher rates of RTI compared to females. Males had fewer burns compared to females. Males had 1.30 times higher rates of falls, 2.46 times higher rates of drowning, and 2.14 times higher rates of poisoning, which were statistically insignificant. Conversely, males had 1.28 times higher rates of occupational injuries which was statistically significant. Hence, vocational school males were found to be at significantly higher risk for RTI, and occupational injuries compared to their female counterparts, whereas burns were higher in females than in males. However, for falls, drowning, and

Table 1. Demographic, Socioeconomic, and Behavioral Characteristics of Vocational Youth.

Variable	Frequency (percentage) N = 547
Age group (years)	
Median (IQR)	19 (18-20)
Range (Max-Min)	(24-16)
Sex	
Male	356 (54%)
Female	191(35%)
Marital status of youth	
Married	45 (8%)
Unmarried	502 (92%)
Technical and Vocational Training Institute	
TVET- Boys A	54 (10%)
TVET-Boys B	321 (58%)
TVET Girls-A	12 (2%)
TVET Girls B	160 (30%)
Youth education status	
Non-educated	12 (3%)
Educated	535 (97%)
Mother's education status	
Non-educated	221 (40%)
Educated	326 (60%)
Father's education status	
Non-educated	110 (20%)
Educated	437 (80%)
Monthly income (PKR)	
Median [IQR]	30 000 (40 000-22 000)
Monthly income (PKR) classification	
≤35 000 PKR	272 (50%)
>35 000 PKR	275 (50%)
Family members in the household	8.4 ± 3.8
Range (Max-Min)	(29-1)
Family members classification	
≤8 members	308 (56%)
>8 members	239 (44%)
Helmet use	
No use	273 (50%)
Used	274 (50%)
Smoking status	
No smoker	532 (97%)
Smoker	15 (2.7%)
Substance use	
No use	538 (98%)
Used	9 (2%)
Gun use	
No use	504 (92%)
Used	43 (8%)
Seat belt use	
No use	307 (56.1%)
Used	240 (43.9%)

poisoning, there is no significant difference between males and females.

Stratification by Age Group

No significant difference in RTI rates were found between 15 to 19 and 20 to 24 years. The 15 to 19 age group had 15% lower rates of burns compared to the 20 to 24 age group, which was statistically significant. The 15 to 19 age group had 18% lower rates of falls compared to the 20 to 24 age group, which was statistically significant. The 15 to 19 age group had significantly lower rates of burns and falls compared to the 20 to 24 age group. For other injury types (RTI, drowning, poisoning, occupational injuries), there is no significant difference between the 2 age groups.

Total Unintentional Injuries (UI_T)

Total unintentional injury count (UI_T) was calculated by summing all unintentional injuries (Table 2). Males had 1.63 times higher rates of unintentional injuries overall compared to females, which was statistically significant. The 15 to 19 age group had 7% lower rates of unintentional injuries overall compared to the 20 to 24 age group, which was statistically significant.

The unadjusted and adjusted IRRs for various factors associated with UI_T are presented in Table 3. This analysis revealed several factors significantly associated with UI_T. Male sex was strongly associated with an increased UI_T, with an adjusted incidence rate ratio (IRR) of 4.05 (95% CI: 1.84-8.91, $P < .001$). Lack of helmet use also significantly increased the risk of UI_T, with an adjusted IRR of 4.54 (95% CI: 2.12-9.76, $P < .001$) while not using a seat belt also increased the risk of UI_T (adjusted IRR = 1.3, 95% CI: 1.14-1.69, $P < .001$). Similarly, carrying a gun was associated with a markedly higher risk of UI_T, with an adjusted IRR of 6.59 (95% CI: 2.54-17.11, $P < .001$). Tobacco use was associated with a slightly increased risk of UI_T (adjusted IRR = 1.25, 95% CI: 1.05-2.69, $P = .049$). Lack of education in the youth was a significant risk factor for UI_T, with an adjusted IRR of 4.6 (95% CI: 1.12-18.91, $P = .034$). Similarly, lower paternal education was strongly associated with UI_T (adjusted IRR = 4.71, 95% CI: 2.12-10.49, $P < .001$). Lower family income (≤35 000 PKR) was associated with a higher risk of UI_T (adjusted IRR = 2.04, 95% CI: 1.04-4.02, $P = .039$), as was larger household size (≥8 members), with an adjusted IRR of 3.59 (95% CI: 3.11-5.07, $P < .001$). In contrast, age ≤19 years showed a higher unadjusted risk (IRR = 2.05, 95% CI: 1-4.2, $P = .049$), but this association was not significant after adjustment (adjusted IRR = 1.61, 95% CI: 0.8-3.27, $P = .184$). Marital status and mother's education were not significantly associated with the outcome.

Table 2. Types of Unintentional and Occupational Injuries in Vocational Youth in the Previous 12 months (2021-22).

Types of unintentional injury	Count (percentage)	Adjusted IRR (95% Confidence Interval)			
		Male	Female	Age 15-19 years	Age 20-24 years
RTI	197 (36%)	**3.24 (2.35-5.30)**	Ref	0.95 (0.87-1.04)	Ref
Burns	137 (25%)	Ref	**2.19 (1.78-3.46)**	0.85 (0.77-0.94)	Ref
Falls	79 (14%)	**1.30 (0.74-2.27)**		0.82 (0.70-0.96)	Ref
Drowning	28 (5%)	2.46 (0.84-7.21)	Ref	0.89 (0.75-1.05)	Ref
Poisoning	15 (3%)	2.14 (0.57-7.58)	Ref	0.85 (0.61-1.16)	Ref
Occupational injuries	95 (17%)	**1.28 (1.19-3.74)**	Ref	1.02 (0.89-1.16)	Ref
Total count = UI_T	551 (100%)	1.63 (1.31-2.04)	Ref	0.93 (0.88-0.99)	Ref

Significant results are presented as boldened. Ref = reference category.

Discussion

This study is among the first to explore unintentional and occupational injuries in vocational youth comprehensively in Pakistan, a population often overlooked in national surveys and surveillance systems. Our findings reveal that males have higher prevalence of RTIs and occupational injuries. No significant sex difference was noted between falls, drownings, and poisonings, while burns were more prevalent among females. Males and older adolescents (20-24 years) were at higher risk for unintentional injuries. Male sex, lack of helmet use, gun carrying, lack of education, lower family income, and larger household size were significant risk factors for unintentional injuries. Tobacco use, and lack of seat belt use were also associated with increased risk of injuries. Age ≤19 years showed a higher unadjusted risk of unintentional injuries. These findings align with global trends but also highlight unique vulnerabilities among vocational youth in Pakistan.

Vocational youth are a distinct subgroup with specific socioeconomic and behavioral characteristics that predispose them to unintentional injuries. Unlike regular school-going youth, vocational students are often excluded from national health surveillance systems, such as the Youth Risk Behavior Surveillance System (YRBSS), leading to lack of consensus on their high-risk behaviors.[40] While some studies suggest that vocational youth share similar socioeconomic characteristics with the general population,[41] others argue that they are more likely to be school dropouts due to low academic performance, limiting their future educational and economic opportunities.[42,43] In our study, 97% of participants self-reported as educated, which likely reflects the minimum criteria for enrollment in vocational training rather than formal schooling completion. This overestimation underscores the need for more accurate measures of educational attainment in this population.[42,43]

Vocational youth are also at higher risk for behaviors such as tobacco use, alcohol consumption, and drug abuse, as well as psychosocial challenges.[42,43] Social, economic, and environmental disparities between vocational and regular school-going youth compound these risks.[20] Targeted behavioral interventions[44] within vocational settings are urgently needed to address these vulnerabilities.[44] For example, integrating health education and risk reduction programs into vocational curricula could mitigate these risks and promote safer behaviors.[44]

The high incidence of RTIs among vocational youth is particularly concerning, given their engagement in risky behaviors, such as not using seat belts and helmets. Our study found a self-reported seat belt use rate of 43.9%, which is higher than rates observed in some Pakistani cities like Peshawar (36%) but lower than in Islamabad (67.44%) and Karachi (40%).[45,46] However, this figure may still be overestimated due to self-reporting bias. Similarly, helmet use among young motorcycle riders in Pakistan remains alarmingly low, with rates ranging from 2% to 5% for males and less than 2% for females.[7,47] These findings highlight the urgent need for interventions to promote road safety among vocational youth.

Policy measures, such as stricter enforcement of traffic laws,[48] public awareness campaigns,[49] and subsidized safety equipment programs, could significantly reduce RTIs. For instance, partnerships with local driving schools to offer free road safety training and subsidized helmet[50] distribution programs have proven effective in other low- and middle-income countries.[51] Additionally, integrating road safety education into vocational training curricula could foster long-term behavioral change.[52]

Occupational injuries are another critical concern for vocational youth, particularly those engaged in manual labor or technical trades. In our study, 17% of participants reported experiencing occupational injuries, a rate 3 times higher than that reported among vocational students in the United States.[21] This disparity may be attributed to differences in occupational safety standards and per-pupil spending on vocational education. In the United States of America, higher educational spending has been associated with lower injury rates among vocational students.[26] Unfortunately, comparable data for Pakistan are lacking, underscoring the need for further research in this area.

Integrating occupational safety training into vocational programs is essential to reduce injury rates.[52] For example,

Table 3. Association of Total Unintentional Injuries (UI_T) With Risk Factors in Youth Presented as Adjusted and Unadjusted Rates..

	Unadjusted		Adjusted	
Factors	IRR (95% CI)	*P*-value	IRR (95% CI)	*P*-value
Sex				
Female	Ref			
Male	3.29 (1.57-6.92)	.002*	**4.05 (1.84 -8.91)**	<.001
Age				
20-24 years	Ref			
≤19 years	2.05 (1-4.2)	.049*	1.61 (0.8-3.27)	.184
Marital status				
Married	Ref			
Unmarried	0.6 (0.17-2.08)	.421	-	-
Helmet use in 30 days				
Yes	Ref			
No	2.12 (1-4.49)	.049*	**4.54 (2.12-9.76)**	<.001
Current tobacco use				
No	Ref			
Yes	1.29 (1.06-3.35)	.023*	**1.25 (1.05-2.69)**	.049
Gun carrying in 30 days				
No	Ref			
Yes	1.16 (1.06-1.48)	<.001*	**6.59 (2.54-17.11)**	<.001
Seat belt use in 30 days				
Yes				
No	1.34 (0.6-0.6)	<.001*	**1.3 (1.14-1.69)**	<.001
Education of youth				
Educated	Ref			
Uneducated	5 (1.15-21.85)	.032*	**4.6 (1.12-18.91)**	.034
Father's education				
Educated	Ref			
Uneducated	3.06 (1.43-6.55)	.004*	**4.71 (2.12-10.49)**	<.001
Mother's education				
Educated	Ref			
Uneducated	0.91 (0.44-1.86)	.794	-	-
Family income				
>35 000 PKR	Ref			
≤35 000 PKR	2.05 (1.01-4.16)	.046*	**2.04 (1.04-4.02)**	.039
Members in household				
<8 members	Ref			
≥8 members	2.37 (1.13-3.67)	.009*	**3.59 (3.11-5.07)**	<.001

Significant results are presented as boldened. Ref = reference category.

incorporating modules on hazard identification, safe work practices, and emergency response could equip students with the skills needed to protect themselves in the workplace.[52] Policymakers should also consider increasing funding for vocational education to improve safety standards and infrastructure.[26]

The trends in unintentional injuries among Pakistani youth have shifted significantly over the past few decades. While the National Health Survey of Pakistan (NHSP) conducted over 30 years ago reported falls as the leading cause of unintentional injuries (48%), followed by RTIs (37.6%), burns (3%), and poisonings (7%),[11] our study highlights a growing burden of RTIs. This shift is consistent with recent global trends and reflects the increasing use of motorcycles among Pakistani youth, coupled with underage driving and a lack of road safety education.[13] In our study, the incidence of RTIs (3.24) was higher than the rate reported in the NHSP (2.48), although direct comparisons are challenging due to differences in age categorization.[10]

Drownings and poisoning, while less common, remain significant causes of injury and mortality. Pakistan has an age-specific drowning mortality rate of 6 per 100 000, with

near-drowning rates among 15 to 24-year-olds estimated at 25%.[53,54] Similarly, unintentional poisonings are a significant concern, particularly among children and youth, with mortality rates in low- and middle-income countries 4 times higher than in high-income countries.[17] These findings underscore the need for targeted interventions, such as community-based drowning prevention programs and public awareness campaigns on poison prevention.

Policy and Intervention Implications

The findings of this study have several important policy and intervention implications. First, there is a critical need for stricter enforcement of existing traffic laws,[48] particularly regarding seat belt and helmet use. Public awareness campaigns targeting vocational youth could help change attitudes and behaviors related to road safety.[49] Second, subsidized safety equipment programs, such as free or low-cost helmet distribution initiatives,[50] could significantly reduce RTIs among young motorcycle riders. Third, integrating occupational safety training into vocational curricula is essential to reduce workplace injuries.[52] Finally, increasing funding for vocational education and training could improve safety standards and infrastructure, ultimately reducing injury rates.[26]

Strengths and Limitations

The major strength of this study is that it reports all unintentional and occupational injuries which are rarely examined together in the youth population. Additionally, it focused specifically on non-fatal unintentional injuries in the community that are often missed. Data on unintentional injuries were gathered as incidence over the previous 12 months, and which makes comparisons with other regions easy. Although the findings of this study are relevant to the Pakistani youth, the sample was taken from one city only. A key limitation of this study is the reliance on self-reported injuries as we lack a verification mechanism, this might have resulted in over-reporting of injuries. Furthermore, a low Cronbach's alpha of the modified WHO questionnaire decreases the validity of the tool used. Convenience sampling limits the generalizability of its findings

Conclusion

This study highlights the alarmingly high rates of unintentional and occupational injuries among vocational youth in Pakistan, particularly road traffic injuries. The unique vulnerabilities of this population, compounded by risky behaviors and socioeconomic challenges, necessitate urgent and targeted interventions. We recommend prioritizing stricter enforcement of traffic laws, implementing public awareness campaigns specifically for vocational youth, and providing subsidized safety equipment, such as helmets. Furthermore, integrating comprehensive road safety and health education into vocational training curricula is crucial. By addressing these critical areas, we can significantly reduce injury rates and improve the safety and well-being of this vulnerable population.

Authors Note

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Ethical Considerations

All methods were carried out in accordance with relevant ethical guidelines and regulations. The study protocol was approved by the Ethical Review Committee at Aga Khan University Karachi (2022-6263-20497) and the National Bioethics Committee Islamabad (4-87/NBC-748/22/1825). Administrative approval was obtained from the Technical and Vocational Education Training Authority (TVETA) directorate Peshawar before the commencement of data collection.

Consent to Participate

Written informed consent was obtained from all participants including ages 15-17 years and 18-24 years. For participants age <18 years written informed consent was also obtained from a parent along with the participants written informed consent.
Confidentiality of the participants was maintained through de-identification of the names of the participants through both phases of the study. Arbitrary numbers were assigned to study participants and used during data entry and analysis. Data was only accessible to the researcher team involved in this research project.

Author Contributions

SM contributed to the design, literature review, data acquisition, and manuscript writing. AH contributed through the conception and design of the study. NUK contributed to the study design and parts of the manuscript. AR contributed to the analysis and interpretation of findings. PP contributed to study design and final editing of the draft. All authors read and approved the final manuscript.

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Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Data Availability Statement

The datasets used in this study are available from the corresponding author on reasonable request.

Supplemental Material

Supplemental material for this article is available online.

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