



The Role of a Community-Based Intervention in Promoting Helmet Use in a Non-probability Sample of Rural Motorcyclists in Iran

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Abstract

Although the use of helmets is known to prevent the majority of mortalities by head injuries, it is ignored by a large number of motorcyclists. The present study was conducted to promote helmet use in an attempt to reduce injuries among motorcyclists in a rural area by adopting a community-based participation approach. The one-group pretest–posttest pre-experimental design was conducted in northwest Iran. The study was conducted in three phases: (1) baseline measurement, (2) implementation of the intervention, and (3) assessment of the outcomes. The intervention included the distribution of learning tools, education of various community groups, tightening of driving laws for offending motorcyclists, promotional programs at community level, and utilizing all opportunities to discuss the benefits of helmets. Due to the non-experimental nature of the study, no causal inferences were drawn. After the intervention, the percentage of the awareness of the benefits of helmet use was increased by 28%, positive attitudes towards benefits of helmet use was increased by 32.6%, and supporting helmet use was increased by 58.6%. Moreover, helmet sale and use increased by 147.0% and 32.0%, respectively. Additionally, motorcycle accidents, head injuries, and mortalities were decreased by 71.8, 55.5, and 60.0%, respectively. Community-based participation approach may positively influence health promoting behaviors and motorcyclists' decisions to wear helmet in rural areas.

Keywords Helmet · Interventional study · Community-based participation · Motorcyclists

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Background

Injuries caused by road accidents have not only increased mortality and disability, but also become a great challenge in public health, particularly in the developing countries, by imposing heavy economical-social costs on individuals, families, society, and public health services [1–3]. In road accidents, deaths caused by motorcycle accidents have turned into an alarming issue in some countries like Malaysia (58%) and Thailand (90%) [4–8]. Furthermore, the highest accident-related mortality rate pertains to the motorcyclists [1, 4], with head and neck injuries being the primary cause [9, 10]. Helmets can reduce severity of head injuries up to 70%, and death risk of the motorcyclists by 40% [1, 4, 9]. A study by Dongo et al. [11] indicated that not wearing helmets contributed to 6.3% of the deaths among motorcyclists [11].

Published research shows that helmet use by motorcyclists is affected by several factors. Considering it unnecessary when riding short distances, feeling of heat and discomfort, spoiled hairstyle, disturbed sight and hearing [12–15], high costs, lack of appropriate information [16], lack of

supervision by the police [17], and considering helmet use as uncommon [12–15] are reported as barriers. Moreover, hearing disturbances, sweating [18–20] as well as restricted vision [18] have been reported as the primary barriers of helmet use in Iran.

There are various approaches to promote helmet use among motorcyclists. The most efficient interventions are coherent, multidisciplinary, comprehensive, and implemented at the community level in an attempt to influence behavioral capabilities of the individuals [19, 20]. In the Ottawa charter, community participation is addressed as a major principle [10, 21], affecting sustainability, satisfaction, knowledge and capabilities, health literacy, and eventually cost-effectiveness of the interventions [11, 22].

Community-based programs can play a major role in increasing helmet use and decreasing accident injuries among motorcyclists [23, 24]. For example, a study by Servadei et al. showed that making helmets compulsory in combination with social media collaboration led to a 95% increase in helmet use, 66% decrease in head injuries of the motorcyclists, and 31% decrease in spinal cord injuries [23]. A systematic review of the literature demonstrated positive effects of these interventions in various communities on increasing helmet use well [24].

Despite the positive role of community-based interventions, our literature review showed that no comprehensive community-based program on the promotion of helmet use has been conducted in Iran. Furthermore, in spite of the mandatory use of safety helmets, a large number of motorcyclists continue suffering from head injuries and traumas [25]. It is recommended that community-based programs and inter-sectoral coordination be considered as an efficient strategy in reducing head injuries of motorcyclists. Thus, the present study was conducted to promote helmet use in an attempt to reduce injuries among motorcyclists by adopting a community-based participation approach.

Methods

Setting

The study was conducted from September 2014 to September 2016 in Charuymaq, East Azarbaijan, northwest of Iran. Charuymaq, with a population of approximately 35,000, consists of the city and 230 villages, is located 180 km (km) southeast of Tabriz, the capital of East Azarbaijan, and has an area of 3208 km².

Design

The study employed a one-group pretest–posttest pre-experimental design to explore the effectiveness of a

community-based intervention to promote helmet use. Due to the lack of a comparison group, no causal inferences were drawn.

Protocol

Baseline assessment of the status and preparation of the intervention design: To design an appropriate intervention, data were collected on the number of motorcycle accidents, resulting head injuries, use of helmet, and knowledge and attitude of the motorcyclists on helmet use. Factors affecting the use of helmet were identified.

Implementation of the intervention: Various activities to promote helmet use were implemented, which included the distribution of learning tools, education of various community groups, tightening of driving laws for offending motorcyclists, promotional programs at community level, and utilizing all opportunities to discuss the benefits of helmets. Implementation of the intervention is summarized in Table 1.

Evaluation of the intervention: The outcome measures were (1) helmet sale after the implementation of the intervention, (2) knowledge and practice of helmet use 2 months later, and (3) mortality rate of motorcyclists in accidents 6 and 12 months after the intervention.

Data Collection

The psychometric properties of the 13-item instrument used to assess the cognitive-behavioral factors were documented by Mehry et al. [26] and Ghasemzadeh et al. [27]. The knowledge of benefits of helmet use was measured by four items ($\alpha=0.7$). An example of the items: “using helmet is very beneficial for me.” The responses were coded as 2 = yes, 1 = I don’t know, and 0 = no. These data were collected before and 2 months after the intervention.

Five items measured positive attitude toward helmet use ($\alpha=0.8$); for example, “use of helmet is exhausting for me.” Four items measured subjective norms of helmet use ($\alpha=0.8$); for example, “my family members always encourage me to wear a helmet.” A 5-point Likert-type scaling (strongly agree, agree, I don’t know, disagree, strongly disagree) was used. These data were collected before and 2 months after the intervention.

To assess helmet use, two questions were asked: (1) Do you wear helmets when riding a motorcycle? (possible answers: everyday, most days, some days, not at all). (2) How many times, out of 10, do you wear a helmet while motorcycling? These questions were used to measure attitudes affecting helmet use behavior. The data were collected before and 2 months after the intervention.

The annual report of emergency unit was used to collect data on the rate of mortality and head injuries among

Table 1 Details of the intervention implementation

Phases of the intervention	Activities	Description of the activities
Baseline assessment of the status of the intervention	Assessment of accidents and mortality among motorcyclists	Documenting accidents causing mortality to assess the rate of injuries and mortality resulting from non-use of helmets, including head injuries
	Observational study to assess helmet use before commencement of the intervention	Recording of helmet use behavior by two observers in a two-week period in two busy locations (gas station, fruit and vegetables shop)
	Assessment of cognitive-behavioral factors regarding helmet use in a sample of motorcyclists	Getting help from trained social workers to record helmet use behavior throughout the study setting
Design and implementation of the intervention	Advocacy for the campaigns	Random recruitment of 150 motorcyclists from motorcycle repair shops around the city
	Holding a coordination meeting for all relevant agencies and organizations	Meeting with organizations and key community members, including head of Healthcare Network, governorate, traffic police, and Sports and Youth Department*; signing a memorandum of cooperation to have their support in running the education campaign
	Introducing the benefits of helmet use by learning tools	Holding a meeting to attract cooperation from the local authorities including governorate, municipality, head of Traffic Guidance, head of Department of Education, head of Healthcare Network, and members of Healthcare Philanthropy Association
	Encouragement of helmet use among motorcyclists by the key local people	Installation of posters (600) and banners (60) in busy and important sites of the area
	Increased supervision of enforcement of laws	Distribution of 200 tracts in public, schools, and offices
	Various promotional programs at community level	Distribution of pamphlets in public, schools, and offices
	Programs in accordance with possible opportunities	Getting help from local health volunteers ^a to encourage motorcyclists wear helmets
		Encouraging women to ask their husbands wear helmets
		Educating the youth on the benefits of helmet use, who would in turn encourage motorcyclist friends and relatives to wear helmets
		Encouraging all motorcyclist staff of public and private offices to use helmets
		Encouraging the public to use helmets at Friday prayers
		Tightening fines for motorcyclists without helmets by the traffic police
		Distribution of advertising pens with labels
		Using murals to promote helmet use
		Marching of motorcyclists to advertise helmet use
		Including safety mottos on official correspondence letterheads in support of helmet use
		Discussion of the benefits of helmet use and encouragement of the present motorcyclists in a meeting held between the parliament member and the local people in a mosque
		Encouraging current motorcyclists to use helmets in a celebration held for social workers

Table 1 (continued)

Phases of the intervention	Activities	Description of the activities
Evaluation of the intervention	Evaluation of the effect	Evaluation of increase in the motorcyclists' knowledge 2 months after the intervention
		Evaluation of increase in helmet use by the motorcyclists 2 months after the intervention
		Evaluation of helmet sale in the area after the intervention
	Evaluation of the outcome	Comparison of motorcyclists' accidents and mortality, 1 and 2 years after the intervention

^aHealth volunteers are a link between people and healthcare workers. These people voluntarily took part in community health activities such as participating in training sessions, educating health issues etc

motorcyclists, the number of motorcycle accidents, and the location of the accidents. The data were collected before, 6 months, and 12 months after the intervention.

To obtain the sale data, all stores selling helmets were contacted immediately after the intervention.

Data Analysis

The Statistical Package for Social Sciences, SPSS, was used for the purpose of data entry, manipulation, and analysis. Descriptive (frequency and percentage distribution tables, measures of central tendency and variability) and inferential (χ^2 Test of Independence) statistics were employed. The level of significance was set, a priori, at 0.05.

Results

The non-probability sample consisted of 150 motorcyclists (80 helmet users, 70 no helmet users). Age differences were not statistically significant. The associations between the use of helmets and (1) income and (2) level of education were statistically significant; specifically, those not wearing helmets had lower economic status and were less educated, compared to those who reported wearing helmets. The use of helmet use was not associated with (1) occupation, (2) having motorcycle driver's license, and (3) history of accidents. The majority of those being fined by the traffic police for not wearing helmets had reported the use of the helmet on a regular basis, and the association was statistically significant. Results are summarized in Table 2.

Results on advocacy related activities with the aim of modifying current policies in favor of supporting the interventional program on helmet use are summarized in Table 3. Encouraging employers to provide their employees with helmets, providing storage space for helmets, forgiving the previous fines for not wearing helmets if a helmet is purchased, and including safety mottos on official correspondence letterheads were deemed instrumental in promoting helmet use.

Analysis of the data showed that at pretest, only 24% of the study participants had a complete knowledge of the benefits of helmets, which was increased to 52% after the intervention. Moreover, 22.7% of the subjects had a positive attitude towards helmet use before the intervention, which was increased to 55.3% after the implementation of the intervention. Before the intervention, 24.7% of the participants demonstrated positive attitudes towards using helmets; after the intervention; it was 83.3% after the intervention, which was statistically significant.

As presented in Table 4, only 12% of the motorcyclists wore helmets before the intervention; it was reported to be 43.2% at posttest. Furthermore, helmet sales 3 months after the intervention was 47, showing an approximately 147%

Table 2 Correlations between demographic variables and use of helmets (n = 150)

Variables	Items	Not wearing helmets N (%)	Wearing helmets N (%)	p value
Age	< 18 year	4 (5.7)	7 (8.8)	0.35
	≥ 18 years	66 (94.3)	73 (91.3)	
Income	Minimum or low	70 (100)	48 (60)	< 0.05
	Medium and higher	0 (0)	32 (40)	
Occupation	Employee	9 (12.9)	8 (10.0)	0.92
	Self-employed	48 (68.6)	55 (68.8)	
	Student	11 (15.7)	15 (18.8)	
	Jobless	2 (2.9)	2 (2.5)	
Education	Primary school	44 (62.9)	15 (18.8)	< 0.05
	Secondary school	22 (31.4)	15 (18.18)	
	High school	3 (4.3)	35 (43.8)	
	University	1 (1.14)	15 (18.8)	
Driver's license	Doesn't have	59 (84.3)	66 (82.5)	0.47
	Has	11 (15.7)	14 (17.5)	
History of fine	No	62 (88.6)	60 (75.0)	< 0.05
	Yes	8 (11.4)	20 (25.0)	
History of accidents	No	13 (18.6)	11 (13.8)	0.28
	Yes	2 (2.9)	8 (10.0)	

Table 3 Policies in the program of advocacy for the helmet use campaign

Encouragement of the motorcyclist staff by rewarding them with helmets by their employers in public offices
Coordination with the guards at the entrance of the offices to allow for the motorcyclists to bring in their vehicles and providing a space for temporary storage of helmets
Forgiving the previous fines of the motorcyclists without helmets if a helmet is purchased
Including safety mottos on official correspondence letterheads in support of helmet use

increase in helmet sale as compared to the same 3 months period in the previous year.

At pretest, there was a total of 39 motorcycle-related accidents, which was decreased to 11 1 year after the intervention, a 71.8% decrease. Moreover, head injuries decreased by 55.5%. Most importantly, our results showed a decreasing trend in the motorcyclists' mortality rate; specifically, from 10 to 4 (60% decrease). Results are shown in Table 5.

Discussion

The present study was designed and conducted to examine the utility of a community-based participation in promoting helmet use by motorcyclists in a rural area. Our findings were similar to those found in the literature [28, 29], suggesting that community empowerment and participation can be instrumental in improving community health. For example, forgiving motorcyclists' previous fines for not wearing helmets if they bought one was implemented in our study and was found to be useful, likely. A study by Bonander

et al. in Sweden reported enforcement of relevant laws and promotional policies play an important role in increasing helmet use and decreasing injuries caused by motorcycle accidents [30].

Regarding evaluation of cognitive factors of behavioral change, an increase in the number of motorcyclists with high knowledge on the benefits of helmet use was one of the achievements in our study; Gresham et al. also reported increased knowledge on safety behaviors following their study's intervention [31]. These results suggest that informing motorcyclists about the benefits of helmet use in preventing head injuries and irreversible harms may play an important role in wearing helmets. Moreover, a change in attitude and tendency of the motorcyclists to use helmets after the intervention could mean that, when people feel a behavior may lead to positive outcomes (e.g., decreased mortality and head injuries, increased sense of security), they most probably would adopt and keep that behavior. Results of similar studies have also revealed that promoting the usefulness of safety behaviors can be effective in creating positive attitude toward them [32, 33]. These findings imply that the

Table 4 Comparison of the motorcyclists' perceptions, helmet use and helmet sale before and after the intervention (N = 150)

Variables	Time			
	Before the intervention		After the intervention	
	N	%	N	%
Knowledge on benefits of helmet use				
Weak	31	20.7	3	2.0
Medium	83	55.3	69	46.0
Good	36	24.0	78	52.0
Positive attitude toward helmet use				
Weak	29	19.3	0	0.0
Medium	87	58.0	67	44.7
Good	34	22.7	83	55.3
Subjective norms on helmet use				
Weak	28	16.7	0	0.0
Medium	88	58.7	25	16.7
Good	37	24.7	125	83.3
Helmet use*				
Yes	92	12	352	43.2
No	674	88	462	56.8
Helmet sale	19**	–	47***	–

*The number of observed subjects was 766 before the intervention and 814 after the intervention

**Data collected from 10/23/2013 through 1/20/2014

***Data collected from 10/23/2014 through 1/20/2015

above-mentioned studies succeeded in influencing individuals' attitudes toward the importance of safety behaviors in preventing injuries and harms. Therefore, it is recommended that improvement of attitudes toward safety behaviors be emphasized in educational interventions.

Subjective norms are among the constructs of Theory of Planned Behavior (TPB) and Theory of Reasoned Action (TRA), and their positive correlations with health behaviors have been established [34, 35]. The results of our study showed that the number of those who urged the motorcyclists to wear helmets increased after the intervention,

suggesting that a greater understanding of helmet use by acquaintances, family members, neighbors, and health centers' staff may positively impact the adoption of the behavior. Similar to our study, Mohammadi Zeidi et al. [33] and Ramezankhani et al. [36] also reported that increased knowledge of the influential individuals may lead to improved subjective norms in support of safety behaviors. A study by Brijis et al. on motorcyclists in Cambodia [37], and another study by Fuentes et al. on adolescent motorcyclists in Spain [38] also showed that subjective norms are one of the major determinants of helmet use behavior among motorcyclists.

Although we are not drawing any causal inferences due to the non-experimental nature of our study, the intervention was effective in increasing helmet use and decreasing head injuries and mortality, which was in agreement with the results of a similar study by Layba et al. who reported that injuries due to motorcycle accidents decreased from 166 to 106 3 years after the intervention [39]. In a study by Kaushik et al., 82.6% of those hurt in motorcycle accidents had no helmets at the time of the accident, supporting the necessity of establishing comprehensive helmet use programs, especially in undeveloped countries [40]. Vriend et al. reported that implementation of community-based interventions may play a major role in increasing helmet use by those susceptible to head injuries [41]. Furthermore, Gupta et al. reported positive impacts of helmet use in decreasing head injuries in developing countries [42]. In accordance with these findings, it is suggested that the legislators, policy makers, and health care professional plan and implement interventional programs for increasing helmet use to prevent mortalities due to motorcycle accidents.

Delimitations, Limitations, and Assumptions

The study was delimited to one region and 2 months of monitoring the progress. Due to non-experimental nature of the study, no causal inferences were drawn. Due to non-probability nature of sampling, external validity was limited

Table 5 Comparison of accidents and mortality rates before, during, and after the intervention

Variables	Time		
	Before intervention*	During intervention**	After intervention***
Motorcycle accidents	39	12	11
Head injuries of the motorcyclist	18	6	8
Mortality caused by motorcycle accidents	10	9	4

*3/21/2013 through 3/20/2014

**3/21/2014 through 3/20/2015

***3/21/2015 through 3/19/2016

to the study participants. It was assumed that the respondents provided accurate data.

Conclusions and Recommendations

Prevention of head injuries in motorcycle accidents can be achieved by public health promotional activities. The results of the present study showed community-based practical approaches can be instrumental in enhancing public health. Potential outcomes are enhancing knowledge, decreasing life-threatening behaviors, increasing helmet use, and consequently decreasing head injuries and mortality following motorcycle accidents. We suggest that future studies consider longer monitoring periods to assess the sustainability of the promotional and educational programs.

Implementation of such interventional programs at the community level may play a significant role in reducing accidents, mortality, and burden by motorcycle accidents. Given the unfeasibility of building safe roads in developing countries, it is recommended to distribute, free of charge, helmets and requiring driving licenses at the time of selling motorcycles.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflicts of interest regarding this study.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Ethical approval to perform the study was obtained from the Ethics Committee in Tabriz University of Medical Sciences.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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