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Article

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Organizational resilience process: integrated model of safety culture

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Abstract

Purpose – The purpose of the study is to create substantial awareness for safety precautions and safety parameters to lessen occupational injuries and accidents. Utilization of safety culture phenomenon with its fundamental understanding has imperative consideration for safety compliance and participation behaviors. Thoughtful aim of this study is the extension of knowledge related to safety orientation particularly in primary health-care workforce.

Design/methodology/approach – Only slips and trips accounted for 40% of workplace injuries in nursing professionals. To identify, the data were collected through structured surveys from nursing professionals of public and private hospitals in Pakistan. To evaluate that data for current study, standardized regression coefficients (parameter estimation) with 95% confidence interval and 5,000 bootstrap samples were subjected. Confirmatory factor analysis was also used to measure the validity of study constructs.

Findings – The potential findings of present study have assured – the presence of safety culture at workplace has potential to influence negative safety outcomes. In addition, safety compliance and safety participation as mediation paths would be the strengthening addition to safety model. These findings have extended the existing understanding of compliance and participation behaviors from single factor to two different constructs of safety orientation. This safety culture model offers an evidence-based approach to nursing practitioners and nursing managers with implications for nurse's safety, education and training.

Originality/value – Occupational injuries and accidental happenings have adversely affecting the quality of care, patient's recovery span, satisfaction level and psychological health in care agents. This study has proposed a comprehensive model for understanding the mechanism of possible and reliable safety



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implications at health-care units. Prior knowledge has limitation to the inevitable effects of occupational injuries only rather than focusing on corrective actions against this phenomenon.

Keywords Safety culture, Safety compliance, Safety participation, Occupational injuries and accident rate, Nursing, Pakistan

Paper type Research paper

Introduction

A body of literature has emerged in the field of occupational injuries and accidents, particularly in response to the measures of safety at workplace (Carpenter, 2017; Chang, Yang & Lauricella, 2019; Dutra, Cimiotti & de Brito Guirardello, 2018; Hafeez, Abdullah, Riaz & Shafique, 2020; Tan, Wang, Chen and Ren, 2012; Read, 2014; Taufek, Zulkifli & Kadir, 2016; Yeh, 2017). Workplace fatality rate has reached at a frightening point, where 2.3 million casualties and 1.9 million severe injuries (Pereira, Ahn, Han & Abourizk, 2020) showing an increasing trend. In response to these figures, organizations are getting more concerned toward employee's safety and respective parameters (Abubakar, Yazdian & Behraves, 2018; Chughtai, 2015; Molnar, Schwarz, Hellgren, Hasson and Tafvelin, 2019). Literature has identifying leadership style, safety management and adequate investment as possible factors were failed to develop a less hazardous environment (Fernández-Muñiz, Montes-Peón & Vázquez-Ordás, 2017; Khan, Ahmad & Ilyas, 2018; Varacallo and Knoblauch, 2019).

Nursing professionals among other health-care employees are consistently facing a major drawback of occupational fatalities (Molnar *et al.*, 2019). Occupational accidental happenings are becoming the worldwide issues for nursing professionals (Marć, Bartosiewicz, Burzyńska, Chmiel & Januszewicz, 2019). Their job description contain handling and taking care of patients, which includes dealing with the body fluids, lifting and moving patients from one place to another and taking care of their hygiene as well (Hunsaker, Chen, Maughan & Heaston, 2015). Meanwhile, they are mostly spending their duties hours in walking, standing and stretching that increases the chances of fatigues, falls, slips and trips. According to *Health and Safety Executive's report* (2012), only slips and trips were accounted for 40% of the occupational injuries and hazardous happenings particularly with nursing professionals. Needle pricks, skin burns, skin allergies, cuts and bruises are one of the most regular form of injuries which they are experiencing (Bamidele, Adeoye, Ntaji & Oladele, 2014). Constant interaction with chemicals, hazardous substances and ultrarays' radiation in surgery operations increases the chances of occupational hazard exposure. These deprived conditions are highlighting the need of substantial arrangement in the form of safety orientation, safety policies and their implementation for nursing professionals to lessen occupational injuries and accident rate (Fan *et al.*, 2016).

It is generally assumed that organizations have been advancing safety in organizational environment to trigger favorable circumstance which organizations needed for safety establishments (Gong, 2019). However, the lack of understanding toward safety culture as different construct from safety climate is becoming the major obstruction in implementation. In relation to safety significance and safety preferences, safety culture considered as the leading strategy to sustain these parameters (Mengolini & Debarberis, 2007) which can persist for longer. However, safety climate is the provisional condition which can be developed to support the specifications of a particular task or project. According to *Theory of Safety Culture (SCT)*, individuals have tendency to learn positive behaviors and attributes from their surroundings (Deilkås & Hofoss, 2010). Safety focused behaviors often depend on learning mechanism which developed through the interacting environments because a safety-focused culture has proactive stance for learning and improving safety behaviors. Safety culture refers to the attitudes,

beliefs and perceptions shared by a group of people, which in turn would determine the way people behave (Newman, Donohue and Eva, 2017).

It is recommended from previous knowledge (Chughtai, 2015; Koranyi, Jonsson, Rönnblad, Stockfelt & Bodin, 2018) that conversation of employee's perceptions regarding safety performance, safety culture should observe in predicting capacity (Inness, Turner, Barling & Stride, 2010; Molnar *et al.*, 2019). Organizations are failing in realizing the potential hazards of their workplaces which eventually effecting their employee's safety culture adoption. It is not only effecting their persuasion toward culture but their compliance and participation behaviors of safety also get pretentious. Moreover, safety culture and safety performance as collective point of interest has been lagging in quantitative consideration (Bondevik, Hofoss, Husebø & Deilkås, 2017; Deilkås & Hofoss, 2010).

The aforementioned descriptions highlighting a great deal of safety proactive behaviors can work effectively for the improvement of safety conditions at workplaces (Smith *et al.*, 2015). Based on precise literature, organizational safety performance can be measured either through the frequency of occupational injuries and accidents (Neal, Griffin & Hart, 2000) or by demonstrating unsafe behaviors and actions (Cooper and Phillips, 2004). According to Griffin & Neal (2000) safety performance as a measure of safety behaviors help better to understand along with its two components as *safety compliance and safety participation* (Inness *et al.*, 2010). Safety culture has potential to carry focus toward compliance because of the cultural consideration for mandatory rules and regulations and establishment for safety provision as voluntary participation (Bagheri Hosseinabadi *et al.*, 2019). Many of the preceding studies had contribution for positive safety outcomes, but how (underlying mechanism or boundary condition) these safety outcomes can be accomplished is merely absent from literature. This gap has been highlighting the demand of attentive mechanisms which can potentially explain the working between safety culture and occupational unfortunate events (Mekkoathil, El-Menyar & Al-Thani, 2016). These behavior mechanisms of individual proclivity have better support for persuading numbers of occupational injuries and accidents. So, the focus of current study is to highlight the relativeness of safety compliance and safety participation to develop suitable implication for health-care organizations. Taken as general, this study has been offering an extensive insight of safety compliance and safety participation as underlying mechanism that can be a pragmatic way of zero-accidental phenomenon.

Nurses in Pakistan are not only facing functional challenges (Jahanzeb and Fatima, 2017; Hafeez *et al.*, 2020) but also cultural orientation is the major cause of problems that influence their duties and ability to sustain against odds of society (Jafree, Zakar, Zakar & Fischer, 2017). A pushing drive behind negative safety outcomes are such conditions which are getting more inexplicable in terms of safety (Feroze, Afzal, Sarwar, Galani and Afshan, 2017), adversative circumstances of safety standards, workload and poor management in health-care units (Islam, Ahmed & Ali, 2019). This geographical division has been providing limited opportunities and facilities to nursing professionals (resource allocation, insurance claims, safety standards, safety parameters, awareness workshops, personal safety training and development) that comes up with adverse circumstances (occupational injuries and frequency of accidents). A very little attention has been given to this profession is getting in terms of safety issues from sociologist, organizational psychologist and health-care practitioners (Hafeez *et al.*, 2020). In provision to existing gaps of literature and practical issues, current study is particularly contributing to the emergent knowledge of safety culture to understand the corrective measures for occupational injuries in nursing.

Current model of safety orientation has explicit interaction with the safety behaviors (compliance and participation) that is helping in understanding the mechanism of positive safety outcomes (Bagheri Hosseinabadi *et al.*, 2019). While holding an extensive review of previous

literature a consistent gap has identified toward safety outcomes as well as potential mechanisms (Reichard, Marsh, Tonozzi, Konda and Gormley, 2017; Stock & McFadden, 2017). Emergent problem of today's corporations is the absence of safety culture along with the increasing number of occupational injuries and accidents. Organizations without identifying the imperativeness of safety culture cannot pragmatically reduce the occurrence of occupational hazards. The focal point among other potential contributing factors is the establishment of preventive mechanism frameworks for occupational injuries through comparing two different measures (Chang *et al.*, 2019). This explicit approach would be an opportunity to understand the human phenomenon as how human shift their intentions from promotion to prevention (Babatunde, Adenuga, Adenuga & Olagunju, 2013). The scope of this research has implications for emergent and consistent issues of health-care sector to improve the key safety-related implications to enhance the professional status and work structure. There is an acute need of such studies those can help in generating consciousness in organizational management to transform their cultural aspects, employees' behaviors through revising their perception regarding organizational hazards (Bamidele *et al.*, 2014; Khan *et al.*, 2018; Molnar *et al.*, 2019). The idea behind proposing safety compliance and safety participation in health-care sectors is helping to understand and implement the safety model for medical professionals especially for nursing because of its emerging need for this profession (Koh & Rowlinson, 2014).

Better to be conscious: a safety phenomenon

Judging from the modern accident causation chain, the idea of safety culture at workplace has consideration toward organizational safety management system and contribution toward structuring prevention focused organizational design (Lee, Phan, Dorman, Weaver and Pronovost, 2016; Riaño-Casallas & Tompa, 2018). This enforcement as safety provision can help to maintain a proactive fight toward occupation injuries and accidents at workplace (Aboneh, Stone, Lester and Chui, 2020; Tear, Reader, Shorrock & Kirwan, 2020). Safety culture has been playing a role of incessant factor of improvement for shaping organizational environment in the presences of hazard exposure (Agency for Healthcare Research & Quality, 2015). Safety culture is an assortment of beliefs, ideas and practices within the organization that are focused toward eliminating occupational hazards through creating awareness between employees about safety requirements at workplace (Gong, 2019).

According to the theory of safety culture, it has consideration in broader spectrum of physical culture, institutional culture, behavioral culture and spiritual culture (Abubakar *et al.*, 2018). It is described as potential factor for employee's spirituality and moral constrain, which further compel their behaviors (Petitta *et al.*, 2017). This enforcement has potential to reduce occupational injuries as well as accidental rate by carrying out standards of safety performance (Cooper & Phillips, 2004). It is suggested that presences of safety culture can enhance employee's focus toward safety preferences and performance (Fan *et al.*, 2016).

Performance refers to the achievement and accomplishment of goals through optimal use of organizational resources (Hu, Griffin & Bertuleit, 2016; Mullen, Kellowa and Teed, 2017). In respect to this, safety performance would be the use of organizational resources (e.g. human resource) to achieve safety goals. Safety performance includes a series of activities that starts from adhering safety rules for organizational employees to sustaining standards through demonstrating in operational work (Pereira *et al.*, 2020). The model of safety performance incorporates two dimensions of safety: *safety compliance* and *safety participation* as performance determinants (occupational injuries and accidents) (Neal *et al.*, 2000). Safety compliance is the essential part of an employee's job in the form of safety standards and adherence to safety practices (Fernandez-Muniz *et al.*, 2017). For instance, those individuals who comply with established safety regulations are less likely to experience occupational injuries than others

(Puchades, Pietrantonio, Fraboni, De Angelis and Prati, 2018). These compliance behaviors have association with substantial importance for organizational safety conditions (Griffin and Neal, 2000). It is important to have safety regulations for every layer of the organization to promote safety orientation (Nævestad, Phillips, Størkersen, Laiou and Yannis, 2019). For instance, employees with low level experience of safety compliance from management, supervisor or colleagues would increase their negligence and insouciance in the culture.

On the contrary, an employee's personal willingness to participate in safety-allied events can enhance safety participation at individual (Griffin and Neal, 2000). However, it is more a voluntary act than following the formal compliance (Fernández-Muñiz *et al.*, 2017). Employees, who have higher job insecurity or fear to lose their position because of workload and uncertainty, exhibit low-level of willingness to participate in safety events, such as safety training and safety awareness workshops (Pereira *et al.*, 2020). Organizational culture that elevates stress and anxiety in employees may influence safety participation behaviors that increase the tendency to respond toward accidental happenings (Koh and Rowlinson, 2014; Abubakar *et al.*, 2018).

A strong safety culture can predict safety compliance at workplace referring employee's encouragement for maintaining safety at conceivable level (Neal and Griffin, 2006; Cooper and Phillips, 2004). An organization with a specific approach towards work completion and product/service quality enhancement, can affect their employee's psychological health in long run. In this way, employee tends to develop less safety-oriented priorities to handle work because of the pressure level. Such type of circumstances increases chances to violate safety compliance as well as safety participation behaviors, which would be the causes of higher number of accidental rates and occupational injuries. They even feel reluctant to follow safety compliance, such as wearing safety instrument, which affect their participation toward attending safety related seminars. It shows when employees act in the form of safety rules and regulations, they more likely to hold participative safety behaviors (Inness *et al.*, 2010).

Preferred circumstances which an organization requires to indulge employees in the workplace settings along with the optimal level of safety performance would be strong safety focused culture. Besides that, organizations often perform structural control (safety compliance) and procedural control (safety participation) to eliminate potential hazard exposure of occupational injuries and accidents from workplace. Structural control is more likely to change in design, time-consuming, more effective and for longer period. While on the other side, procedural control is immediate, less time-consuming and effective for business operations. Therefore, this study has hypothesized safety compliance and safety participation as potential underlying mechanism between the nexus of safety culture and occupation injuries and accident rate (Figure 1):

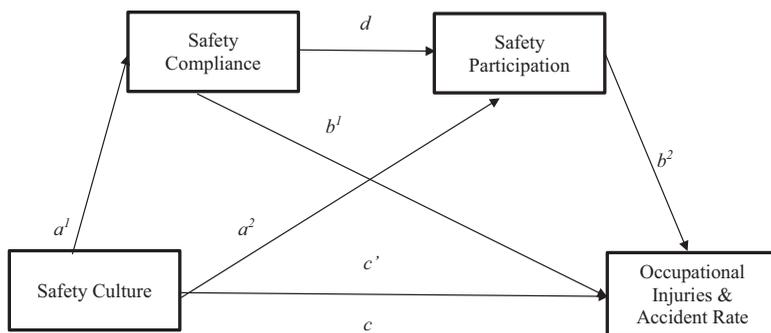


Figure 1.
Research framework
with sequential and
parallel mediation

-
- H1. Safety compliance mediates the negative association between safety culture and occupational injuries and accident rate.
- H2. Safety participation mediates the negative association between safety culture and occupational injuries and accident rate.
- H3. Safety culture has a negative association with occupational injuries and accident rate through safety compliance and safety participation as serial mediation.

Material and methods

Research design

This research aims to integrate an objective approach which deals with numerical data, hypothetical testing and statistical analysis (Haneef, 2013) through examining predetermined variables of interest. A quantitative descriptive approach helps researchers to ascertain the firmness and objectivity of predetermined variables which leads to stiff adherence of research designs and statistics analysis (Ryan, 2008). Quantitative methodologists use a statistical-based analysis model by testing the hypothesized relationships between predetermined variables (safety culture, safety compliance, safety participation, occupational injuries and accident rate) that generalize and formulate predictions from a sample group of a large population (Haneef, 2013).

Research procedure

The population of this study was based on nursing professionals of private and public hospitals of Pakistan. The target population holds those who typically have to spend 12 h at their respective workplaces. The reason behind targeting this sector is the poor wellbeing and frequent increase in accidental happenings on daily basis (Mertens, 2014). The increase in number of accidents is also pinpointing toward the lack of basic knowledge about personal safety, shortage of safety awareness programs at workplaces, shortage of trained staff and inadequate monitoring and legislation by government. Sample was drawn through probabilistic sampling technique (Poortman and Schildkamp, 2012). Probabilistic-sampling technique is significant for quantitative researches and provides convenience at a level where researcher requires selecting sample from a larger population. It has supported research team to select a small sample size with equal opportunity to each participant to minimize the potential sampling errors (Rea and Parker, 2014; Omair, 2014).

Data was collected through personally administrated questionnaires. According to Tella (2015), a paper pencil approach in surveys has positive impact on response rate as compared to electronic surveys. Mainly because of face-to-face interaction, availability of researcher and availability of guidance in case of having not enough understanding (Tella, 2015). It was based on mainly two sections; first section included demographical questions, such as age, gender, tenure and working experience in the current organization. Demographic characteristics tend to analyze the participants characteristics to understand the phenomenon (Ostermeier and Camp, 2016). While the second section included the questions related to study variables particularly to measure the individual perception for the analysis. Respondents were invited to participate in the study through prior permission of hospital authorities. It helped research team to maintain the decorum of hospitals.

Provisionally, statisticians have developed tools that can be used in conjunction with popular statistical software for conducting and interpreting complex analyses. One such tool is the PROCESS macro developed by Hayes (2017) which is essentially an extension to compute regression analyses containing various combinations of mediators, moderators and

covariates. It provides an overview on how to fit proposed model with already subjected model by Prof Hayes. For current analysis, the conceptual model was particularly divided into two parts to evaluate *parallel* and *sequential* mediation (Models 4 and 6) between (a) safety culture → safety compliance → organizational injuries and accident rate. The idea behind choosing two alternative models rather than a single model is to evaluate the multiple conditioning of safety compliance and safety participation between safety culture and occupational injuries. According to [Cohen \(1977\)](#), it is important to predict statistical relationship between predictor and outcome variables in a sequential way to explore the relative influence at different stages of evaluation. It gives an idea about proposed framework could perform better in actual implementation. Safety compliance and safety participation in parallel mediation integration have indication of how individuals can eliminate the frequency of occupational accidents. Moreover, it provides an opportunity to compare the effect to significant implications. However, in sequential mediation knowledge related to safety orientation will get an update dimension of safety and responded toward the existing gaps ([Hasanzadeh, Esmaeili and Dodd, 2017](#); [Madarasara, Kudakan, Yari and Saeidabadi, 2019](#)). As organizational safety standards and policies have tendency to develop a participatory behavior to promote safety at individual level. Therefore, the supposition related to safety compliance to safety participation is an emergence of theoretical underpinning related to safety outcomes.

Ethical consideration

All of the participants who contributed for this study as respondent were well informed about the purpose of this study. They already provided their written consent before collection of data. The research team followed the procedures and protocols of data collection, data recording and confidentiality of data as per international standards. This research does not necessarily require ethics approval in accordance with the institutional guidelines (researcher's institute) and national regulations. This research had been performed to identify the safety culture as safety support system and its determinants through statistical analysis in natural settings. However, the research does not involve any lab experiment or clinical trials on female respondents and maintained their anonymity throughout the process.

Instruments

Quantitative researches apply different measures or instruments for valid data collection of the variables for the assertive examination of constructs. Therefore, the following instruments were used to measure the construct; **Safety culture** was assessed through a four-item scale developed by [Arboleda, Morrow, Crum and Shelley \(2003\)](#). Respondents were asked to rate their responses on five-point Likert scale ranging "1" for "strongly disagree" to "5" for "strongly agree." **Safety compliance** as measure of safety performance was assessed through a three-items scale developed by [Neal and Griffin \(2006\)](#). Respondents were asked to rate their response on five-point Likert scale ranging "1" for "strongly disagree" to "5" for "strongly agree." **Safety participation** as second component of safety performance was measured through a three-items scale of [Neal and Griffin \(2006\)](#). Respondents were needed to rate their response on five-point Likert scale ranging "1" for "strongly disagree" to "5" for "strongly agree." **Occupational injuries and accident rate**: It is perceived as reliable and consistent approach to measure safety outcomes through self-reported occurrence or involvement in accident. Therefore, three questions were incorporated to measure the self-reported occupational injuries and accidental rate faced by nurses and hospital attendants at workplace. This scale was

adopted by the study of [Siu, Phillips and Leung \(2004\)](#). A six-point scale will be provided to range from 1: never to 6: five times or more and help to measure occupational injuries.

Control variables

Participants nurses were asked to respond toward their age, organization's nature (public/private) and job specifications (registered nurse, contractual nurse, practically license nurses). These particulars were controlled study analysis as earlier researchers have revealed them as influencing factors ([Hu et al., 2016](#)). This ensures that the associations between variables are not confound.

Results

Preliminary analysis

Descriptive statistics have predominant consideration as the primary check of data before experiential analysis. In respect to this, female participation was quite higher as they were accounted 93% of total sample and 62% from them were reported as registered nurses. The ratio of female participation confirming the fact of, nursing as highly gendered profession in Pakistan. It is generally observed that core of nursing is to provide quality care and assist those who are in need of medical support ([Kalisch, Doumit, Lee and El Zein, 2013](#); [Leyva, Beaman and Davidson, 2017](#)). Their job description normally contains particularly handling and taking care of patients, which include dealing with the body fluids, lifting and moving patients from one place to another and taking care of their hygiene as well ([Hunsaker et al., 2015](#)). While such kind of perception becoming the source of obstruction for male workers, who can potentially serve in this sector. These unseen constraints are stopping their ways to be part of this profession. In addition to this, Pearson correlation was performed to evaluate the strength and nature of relationship between the observed variables. The description by [Table 1](#) indicates significant but negative relationship between organizational safety culture and occupational injuries. Correspondingly, safety compliance and safety participation as construct of safety performance had approached occupational injuries and accident rate negatively but significantly ([Table 1](#)). Other than this, safety culture as single predictor of proposed model had strong provision for safety compliance and safety participation behaviors.

Confirmatory factor analysis

Confirmatory factor analysis (CFA) had facilitated in assessing the factor loadings of measures. It was performed to evaluate the construct validity through convergent validity

Constructs	Mean	SD	A	G	P	SC	SCP	SP	OIA
Age	2.69	1.02	1	–	–	–	–	–	–
Gender	1.93	0.24	–0.19**	1	–	–	–	–	–
Position	1.57	0.81	–0.13	–0.09	1	–	–	–	–
Safety culture	3.24	0.86	0.03	0.08	–0.03	1	–	–	–
Safety compliance	3.83	1.05	0.03	0.12*	–0.09	0.43**	1	–	–
Safety participation	4.12	0.75	0.08	0.28**	–0.11*	0.26**	0.36**	1	–
Occupational injuries and accident rate	2.96	0.91	–0.27	–0.05	0.10*	–0.39**	–0.27**	–0.23**	1

Notes: $N = 385$, age, gender and position are control variables, * $P < 0.05$ and ** $P < 0.01$

Table 1.
Descriptive statistics
and correlation
analysis

and discriminant validity. According to [Anderson and Gerbing \(1988\)](#), to evaluate how close the indicators are coming to determine the validity of construct (convergent validity) must have to perform three *ad hoc* calculations standardized loadings, average variance extracted and composite reliability. The evaluation of study constructs, such as safety culture (four items), safety compliance (three items), safety participation (three items), occupational injuries and accident (three items) was analyzed through CFA to establish the current model ([Table 2](#)). These construct items were reasonably loaded between the ranges of 0.69–0.91 at the minimum cut level of 0.5. The purpose to use the CFA was to ensure appropriateness and credibility of the instrument related to study. In respect to this, various indices were estimated to find out the model fitness and sophistication of variables toward current study. The fit indices of current model demonstrating the suitability of instruments and related items as they were in acceptable ranges, $\chi^2 (1.9, N = 640.30) = 2.67, p = 0.01$, Normed Fit Index = 0.89 (<0.90), Comparative Fit Index = 0.911 (>0.90), Tucker-Lewis index = 0.97 (>0.90) and RAMSEA = 0.64(<0.80).

Hypothesis testing

Testing mediation proposition

To analyze the hypothesized mediation outcomes of safety compliance and safety participation along with the direct effects of safety culture on occupational injuries and accident rate, the regression-based method called PROCESS macro was performed. This method was recommended by Hayes to analyze the overall significance of effects through nonstandardized beta coefficients and parameter estimations ([Hayes, 2017](#)). It can potentially curtail the statistical power problem which may ascend because of the asymmetric or other sampling procedures ([Mackinnon et al., 2004](#)). In addition, the presence of confidence interval (CI) in the form of upper level of confidence interval (LLCI) and lower level of confidence interval (ULCI) for the evaluation of indirect effects provides convinces. However, determination of analysis while performing bootstrapping method, the CI was set as 95% bias-corrected along with 5,000 resampling values. The implication of effect was considered to be significant at the level of 0.05.

To analyze the mediation parameters of *H1* and *H2*, Model 4 from PROCESS macro for parallel mediation along with the bias corrected percentile bootstrapping method was applied. A four-step based procedure suggested by [Baron and Kenny \(1986\)](#) to examine the mediation paths of proposed model was adopted. According to them Step 1 is based on significant association between safety culture (SC) and occupational injuries and accident rate (OIA). In Step 2, a significant association must lie between:

Construct descriptions	χ^2	RMSEA	NFI	CFI	χ^2	TFI	CR	AVE	DV	ALPHA
Fit indices	2.67	0.064	0.893	0.911	640.30	0.971				
SC	–	–	–	–	–	–	0.89	0.68	0.82	0.86
SCP	–	–	–	–	–	–	0.89	0.74	0.86	0.77
SP	–	–	–	–	–	–	0.90	0.76	0.87	0.79
OIA	–	–	–	–	–	–	0.86	0.68	0.83	0.82

Table 2.
Confirmatory factor analysis and reliability analysis

Notes: RMSEA= root mean square error of approximation; NFI= normed fit index; CFI = comparative fit index; TFI = Tucker Lewis fit index, CR= composite reliability, AVE= average variance extracted; DV= discriminant validity

- SC and safety compliance (SCP); and
- SC and safety participation (SP).

In Step 3, a significant relationship between:

- SCP and OIA; and
- SP and OIA must be there.

Finally, in Step 4, the overall significance must lie between SC and OIA through SCP and SP.

The first step of this analysis as [Table 3](#) has been showing the total effect (direct effect + indirect effect) of safety culture on occupational injuries and accident rate ($c = -0.27, se = 0.05, t = -7.49, p < 0.001$). On the contrary, the direct effect of safety culture on safety compliance ($b = 0.53, se = 0.05, t = 9.42, p < 0.001$) and safety participation ($b = 0.34, se = 0.04, t = 5.35, p < 0.001$) were statistically significant (Step 2). In subsequent step, when safety compliance ($b = -0.23, se = 0.054, t = -8.23, p < 0.001$) and safety participation ($b = -0.21, se = 0.059, t = -4.22, p < 0.001$) enter into the model as parallel mediators specifically shown direct negative effect on safety outcomes of this model (Step 3). In similar equation, the direct effect of safety culture on occupational injuries and accident rate ($b = -0.13, se = 0.056, t = -4.72, p < 0.05$) was statistically satisfactory (Step 4). Besides that, the overall model was proved as statistically reliable ($F = 64.21, p < 0.001$) with ($R^2 = 0.393$) 39% total variation in occupational injuries and accident rate.

More precisely the total indirect effect of safety culture on occupational injuries and accident rate had found support of partial mediation relation through safety compliance behaviors (SC→SCP→OIA, parameter estimation (PE) = -0.121, BCa CI [-0.3146, -0.1798]). Therefore, *H1* has found statistically partial mediation ([Table 3](#)). On the contrary, the total indirect effect of safety culture on occupational injuries and accident rate through the mechanism of employee safety participation (SC→SPT→OIA, PE = -0.073, BCa CI [-0.2198, 0.1784]) had showed presence of partial mediation, which means *H2* is not fully supported ([Table 3](#)). In the meanwhile, statistical evaluation of safety compliance toward the relation between safety culture and safety outcomes had greater strength than safety participation behaviors. Put simply, organizations which are carrying compliance and safety laws can get better safety situation. It might be due to cultural difference of Asian region where power distance and centralization is the core of organizational structures.

In the next stage, Model 6 from [Hayes \(2017\)](#) was implemented to evaluate sequential mediation impact (SC→SCP→SPT→OIA) of safety compliance and safety participation with the 95% CI and 5,000 bootstrap samples. This model has contribution toward

Predictor	Model 1		Model 2		Model 3		Model 4	
	Total effect (OIA)		Direct effect (SCP)		Direct effect (SP)		Direct effect (OIA)	
	<i>C</i>	<i>t</i>	<i>B</i>	<i>t</i>	<i>B</i>	<i>t</i>	<i>B</i>	<i>t</i>
SC	-0.27	-7.49**	0.53	9.42**	0.34	5.35**	-0.13	-4.72*
SCP	-	-	-	-	0.54	11.67**	-0.23	-8.23**
SP	-	-	-	-	-	-	-0.21	-4.22**
R^2	0.27	-	0.31	-	0.28	-	0.39	-
<i>F</i>	34.43**	-	49.25**	-	41.96**	-	64.21**	-

Notes: Each column is a regression model that predicts the criterion at the top of the column. * $p < 0.05$, ** $p < 0.01, N = 217$, bootstrapping at 5,000

Table 3. Hypotheses testing through bootstrapping method

comparing the indirect effects with specific indirect effects (Table 4). The total effect (difference between the total effect estimation and direct effect estimation) of safety culture on occupational injuries and accident rate through safety compliance and safety participation behaviors were found to have significant estimation (PE = -0.141, BCa CI [-0.3204, -0.2136]). Whereas, the indirect effect of this relation carrying a statistically significant but weak relationship (PE = -0.067, BCa CI [-0.1186, -0.0678]). Therefore, H3 is not fully supported in final analysis (Table 3). In addition, contrasting findings presented in pairs (Table 4) in the current research to determine whether specific indirect effects of mediating variables were stronger than others. Current research analysis results showed three contrasting pairs were obtained. The difference in the indirect effects of these models found significant difference. In comparison, Model 2 was found statistically best model at a zero-point estimate interval within the 95% BCa CI (Figure 2).

Discussion

Previous literature has approached occupational accidents with leadership style (Khan et al., 2018), organizational policies (Gong, 2019), safety measures (Hu et al., 2016) communication and coordination (Read, 2014). However, the major implication of previously suggested models was the complex and constrained implementation. Present study has extended previous literature of safety culture from formal philosophy, thinking patterns, socialization, metaphors and artifacts to wide-ranging pragmatic solution of safety outcomes. The present-day approach of safety culture is a belief of potential predictor for initiating and

Effects	Product of coefficient		Confidence interval	
	PE	SE	LLCI	ULCI
Total indirect effect	-0.141	0.0261	-0.3204	-0.2136
SC→SCP→OIA	-0.121	0.0276	-0.3146	-0.1798
SC→SCP→SP→OIA	-0.067	0.0277	-0.1186	-0.0678
SC→SP→OIA	-0.073	0.0214	-0.2198	-0.1784
Model 1 vs 2	-0.054	0.0273	-0.4923	-0.3441
Model 1 vs 3	-0.048	0.0267	-0.2231	-0.0357
Model 2 vs 3	0.006	0.0210	-0.2791	-0.0279

Table 4. Comparison of indirect effects

Notes: N = 285, k = 5,000. Table represents the comparison between the Indirect effects of safety culture on occupational injuries and accident rate through safety compliance and safety participation. *p < 0.05, **p < 0.01

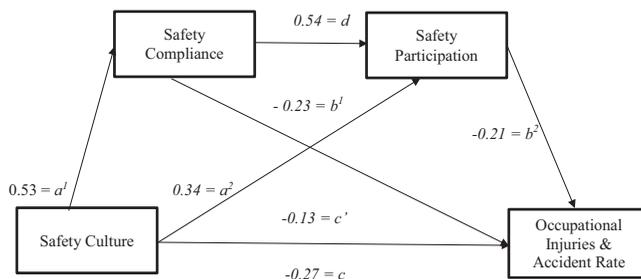


Figure 2. Final model represents significant paths

stabilizing safety compliance and safety participation behaviors in employees at workplace (Mengolini and Debarberis, 2007). This study has suggesting safety culture as establishing factor for organizational structure particularly on the grounds of safety preferences and safety provisions. Learning through interaction with in the organizational culture can lead to bring change in perceptions and behaviors. In case of interaction with people of ethical consideration can lead to permanent and speedy change in behaviors (Driscoll, 2000). This type of change refers to an enduring change in ethics and moral consideration as well as the ability to influence others through interaction and communication (Qian, Liu and Chen, 2020; Shuell, 1986). This integration of system can also prompt employee's consciousness toward safety promotion in the organizational environment (Gong, 2019). Lack of institutional support toward safety rules and regulations can develop psychological and psychical obstacles for nurses to follow safety parameters (Baljani, Azimi and Hosseinloo, 2012; Vaismoradi, Bondas, Salsali, Jasper and Turunen, 2014). Present analysis has revealed presence of shared perception toward safety at every level along with personal consideration for ethics, merit and moral traits can boost employee's confidence and willingness to participate in safety programs (Ahmad and Umrani, 2019).

To guard against negative safety outcomes, safety compliance and safety participation have been explaining this mechanism of safety orientation (Khan *et al.*, 2018). Safety compliance as the assemblage of subsequent safety rules has stronger and potential implication in current analysis. Whereas, safety participation as the personal willingness of an employee to sustain safety behaviors in organizational setup promoting employee empowerment (Shen, Ju, Koh, Rowlinson and Bridge, 2017). Previously, the theoretical and practical conceptualization of compliance and participation had limitation because of their provision as together. However, they both are different in operations and functionality. For instance, organizations should hold a flexible focus on safety standards and policies at first to promote personal willingness in employees to participate in safety programs (Smith *et al.*, 2015). According to present findings, safety compliance and participation is the combination of fulfilling the demands of what is required and to go beyond what is necessary to achieve safety improvement in a subjective approach. The subsequent focus has also promoting concentration on understanding the social culture as learning resource for employees to eliminate or obstruct the negative safety outcomes (Olsson, Pärnamets, Nook, Lindström and Olsson, 2018). The contrivance of approaching toward less hazardous environment requires adoption of smooth channel of communication for safety policies and cultural attributes (Juárez-Carrillo, Liebman, Reyes, Ninco Sánchez and Keifer, 2017).

However, the focus of safety participation as component of safety performance has presented statistical interaction with safety compliance (Jiang and Probst, 2016). Put simply, findings of this study also extending previous understanding through highlighting safety compliance as potential influencer of safety participation as well. Safety culture with its native focus on the progress of learning and development of safety compliance can help employees to demonstrate safety actions. This persuasion can further trigger the participation behaviors of employees. It includes participation in safety programs, suggestions to enhance safety system, helping colleagues to protect from occupational injuries, reducing accidental and hazards exposure and reporting safety rules violation (Deilkås and Hofoss, 2010). This sequential framework has been contributing in literature as the attainment of positive safety performance will also be acquired through safety compliance behaviors. Employee's inclination to compel with the organizational safety standards helps to avoid the potential hazards. Moreover, these compliance behaviors can further prompt an employee's voluntary participation in safety concerns and develop a significant negative influence on accidental happenings. However, the statistical evaluation

identifies a weak indirect impact of this sequential relation as compared to the parallel mediation effects. This might be because of the cultural preferences or organizational structure which can intervene as potential boundary condition. It would be interesting for future conceptualizations of current framework to evaluate the main stream of organizational cultural, employee empowerment and power distance for considerable contribution in literature.

Most of the earlier persuasion toward safety had approached safety critical workplaces, such as production industries, oil and gas, chemical industries and mining industries where risk for accidents is pervasive (Kumar, Priya and Gayathri, 2018; Sargent, 2018). However, this persuasion abandons those sectors which are not high in risk but not easy to neglect (Jiang and Probst, 2016). Now there is an emergence of interest that showing an upsurge in other sectors, such as academics (Gong, 2019; Perrin, Gabas, Corriou and Laurent, 2018) telecommunication (Khan *et al.*, 2018), process industry (Fernández-Muñiz *et al.*, 2017) and health-care sector (Chugtai, 2015). Current study has extended existing knowledge of safety provision in health-care sector from doctors and paramedical staff to nursing professionals (Islam *et al.*, 2019; Liu, Zhou, Cheng and Zhu, 2020). Eventually, these occupational injuries and accidents cost them heavy financial burden in the form of insurance claims and interruption in job duties. Consequences of safety negligence in health-care sector can also affect patients in the form of late discharge, psychological distress or higher span of recovery (Vaismoradi *et al.*, 2014). It indicates that an organization suffering because of poor safety provision (occupational injuries and accident rate) is not only limited to employees but also organizational structure can be on stake (Marć *et al.*, 2019). It is recommended that future researcher should take patients safety into consideration in case of poor safety behaviors of employees. Such findings would help hospital management and regulatory bodies to generate interventions and measures to minimize injuries and accidents in the workplaces.

Practical implications

To obtain and retain competitive workforce, organization's foremost way is to provide a safe and healthy workplace. The idea behind a safe and healthy working environment is to give surety to employees through safety-focused culture, where they are working is safe enough to protect them from workplace hazards (Jiang and Probst, 2016). The scope of current study has multidimensional implications, such as for health-care policy making, hospital management, nursing research and development associations, nursing head and nursing employees. This study highlighted the need of promoting safety orientation for hospital administration through safety culture to eliminate the fatal injuries and unfortunate events. Presence of safety in the culture as shared means would help hospital administration to deal such incidents that cause them financial burden, loss of human skills and interruption in workplace activities (Kumar *et al.*, 2018). This study is providing implications for nursing managers and nursing heads in recognizing the need of safety compliance and safety participation as way to support employees in avoiding occupational hazards. In addition, this study has been offering valuable insight of the situations where poor working conditions trigger the potential hazards. For instance, when health-care sector deprives the importance of protective measures of their workplace, such as wearing and changing gloves, wearing mask, disposing wastage, chemical handling and sterilization of instruments changes the safety priorities (Juárez-Carrillo *et al.*, 2017). This study would be an eye-opening scenario for nursing employees in terms of the importance of safety participation and safety behaviors. It would give the realization of having safety awareness at individual level will able them to work as care agents effectively.

Theoretical implications

Occupational injuries and accident rate can be effective to measure the safety performance of the organization. It is considered as undesirable outcome for any workplace because of the afterward consequences (McCaughy, McGhan, Walsh, Rathert and Belue, 2014). In other words, occupational injuries and frequency of accidents decrease the employee's performance and competitiveness of particular organization as well. Earlier the knowledge has confined up to safety performance as safety predictor, whereas a very smaller number of studies have worked on safety performance as preventing measure to reduce occupational injuries and amount of accidents (Molnar *et al.*, 2019). The perplex findings and contracted nature of studies prompt the idea of current study which theoretically contributing in knowledge to enhance previous understanding of safety culture as the focal point of creating safe and healthy atmosphere to promote safety at workforce (Islam *et al.*, 2019). This study showed the emerging intentions toward explicit understanding regarding safety culture to eliminate the increasing trend of occupational injuries and accident rate. It illuminates the functionality of safety performance in the form of safety compliance and safety participation as major preventive strategy of occupational injuries and accidents at workplace. However, the previous knowledge is limited up to safety performance as the way people behave. This study is also contributing theoretically through providing an in-depth statistical analysis of safety compliance and safety participation as preventive parameter of occupational injuries and accident rate. Additionally, the previous knowledge of nursing professionals of Pakistan is limited in terms of safety and safety parameters. Current study reveals the contemporary situation of nursing in Pakistan as they are facing major shortage of resources from organizational management and head nurses. It provides the comprehensive analysis of preventive actions that are needed to be performed in responses to mitigate the risk associated with unsafe working environment.

Limitations and future directions

The eventual findings proposed significant contribution to health-care organizations as well as safety knowledge but limitations for current study persist yet. The exploratory focus of current study is to explore the role of organizational safety culture in minimizing safety related negative outcomes through safety performance components (Smith *et al.*, 2018). However, the exploratory nature of current study limited its focus only to statistical evaluation of this relation. This type of study sometimes restricts the vision of bigger picture for researcher and for future researchers as well (Bell *et al.*, 2013). Another limitation of methodological selection in current study was the selection of target population. Although data was collected from Pakistan's major cities but the cultural conditions and economic disparities might have influence on the thought process of the respondents. Cultural influence and contextual factors have impact on individual's perception while responding toward safety parameters. Similarly, the nurse's opinion might have influence of contextual factors which affected their perceptions. The implementation of safety standards, rules and regulations vary in different geographical divisions. This differentiation could influence their willingness to participate in safety related programs (Reichard *et al.*, 2017). Therefore, it could be considerable limitation for current study. Data was primarily collected from nursing professionals of public and private sectors. Nursing profession in Pakistan is still confined to females. This single gender participation in data collection might have similar perception toward the workplace safety crises and willingness for safety participation. It showed the personality traits of the respondent might be the intervening indicator in this

model. Yet, it could be a potential contribution to literature to analyze and evaluate respondent's personality to better understand their perception of safety and safety significance.

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