Mental Health Status and its Relationship with Accident and Unsafe Behavior in a Printing and Press Industry, 2014

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ABSTRACT

Physical and psychological health of workers is critical factors in the performance of their works. Also, the number of fatal occupational accidents is high in our country. Based on these facts assessment and control of accidental determinants as well as their relationship with behavior and mental health of workers is vital. This study aimed to survey the relationship between general health, occupational accident, behavioral safety and demographic variables in a printing and publication industry located at a central province of Iran in 2014. In this cross-sectional study, all operational employees (98 persons) were included. Demographic questionnaires, Goldberg general health-28, safety behavior checklist and self-reported accidents were tools used to gather data. Statistical analysis such as independent T-test, ANOVA and Pearson correlation were used and evaluation of data was done using SPSS V20. All workers were men of mean age 41.79±6.77. Studied personnel who had experienced occupational accidents were in the case range of 0-5. Furthermore, 80.75% of the total observed behaviors (800) were safe. Mean score of GHQ test was equal to 50.38±10.39 which was over 23 as the cut-off point. There was no significant relationship between mental health with safe behaviors ($p>0.05$). In summary workers' mental health status was unacceptable. Although, conditions of work which was based on the occupational accident and safety behavior have not shown any situation of caution, using ABC model (Activators-Behaviors-Consequences) can help promote personnel behaviors and anticipate accident control.

Key words: Mental health, Occupational Safety, Accident, Behavior Sampling

LIST OF ABBREVIATIONS

General Health (GH)
Safety Behavior Checklist (SBC)

INTRODUCTION

Based on the WHO's definition, Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. Also, mental health is a level of psychological well-being, or an absence of a mental disorder. It is the psychological state of someone who is functioning at a satisfactory level of emotional and behavioral adjustment [1, 2]. Despite numerous attempts to define general health, there is no unique and universal definition. However, general health as one of the health care sub-systems is configured including a set of individual, environmental and organizational actions that relied on preventive issues. It has been documented that general health leads to increased well-being and satisfaction of men [3]. In organizational views, the importance of general health increased further. In a healthy organization, physical and mental health of employees apart from production and financial benefits would include management directory as well. Also, a documented and clear program exists for adverse conditions of workplaces and accident prevention procedures [4].

With the spread of industries especially in developing countries such as Iran, the need for workforces in these sectors of activity is increased. On the other hand, stress, anxiety and other psychological issues as consequences of this process were continuously developed. Hence, occupational specialists should also pay attention to these new challenges [5]. Mental health is an important aspect of health. Lack of attention to it has been shown as occupational stress and depression [6, 7]. It seems that mental health in developing countries has been far from views in the area of occupational safety and health [8]. Healthy

workers are knowledgeable and have powers such as comfort, right judgment and vitality [9, 10].

According to the International Labor Organization (ILO), 34.2 million people die from work-related accidents and diseases, 314 million people suffer from occupational injuries every year [11]. It should be noted that costs arising from these issues were estimated to be equal to about four percent of world's GDP. It was documented that unsafe behaviors were mainly responsible for accidents [12]. Human behavior refers to the array of every physical action and observable emotions that are associated with individuals. In addition to being dictated by age and genetics, behavior is driven in parts by thoughts and feelings [13]. On this basis, behavior in different situations would be flexible from one person to another. This is for various reasons, such as different individual factors, external influences or any changes in environmental circumstances. Safety behavior such as speaking about safety or application of personal protection using equipment aside climate safety and safety management has been considered as a component of an organization's safety culture [14, 15].

Printing industry is considered as one of the most important industries in Iran. Qom province comes next after Tehran with more than 14,000 books in circulation of which 56 million copies have been published annually. Workers in this industry are exposed to chemicals and solvents as a result of the old process and their machines, and are involved in broad occupational accidents and disorders [16].

Considerable developments in a variety of researches about social and psychosocial factors have recently been seen. Issues such as depression [17], quality of life [18], absence from work [9], mental load [19], mental-based complaints [20], job dissatisfaction [21] and sleep disorders [22, 23] have been classified as a social climate of work units. Also, work-related accident as an important challenge has continuously been created in our industries [24] and in a number of studies involving the relationship between general health status and the incidence of occupational accidents has been proven [25, 26]. In different workplaces, it was revealed that reducing the level of public health issues can lead to enhancing near misses and accidents [9, 27]. In one study, a positive correlation has been shown between poor health conditions and unsafe behaviors [28] as well as between accident and depression [29, 30], stress [31, 32] and anxiety [33]. It seems that scientific information on mental health and its relationship with accident and behaviors would be valuable at the national and regional levels and in the occupational, safety and health decision makers.

Questionnaire as an inexpensive and reliable subjective tool are widely used. Other methods such as objective and experimental are considered much more expensive to administer. Hence, a valid and reliable Persian version of GHQ-28 was applied [34].

Based on the text mentioned above, this research was designed and aimed at investigating the relationship between general health, occupational accidents, safety behavior and demographic variables in the publishing industry located in Qom province (in the south of Tehran), Iran in 2014.

MATERIALS AND METHODS

The present study was cross-sectional and it took place among all operational personnel (98), in 10 jobs such as manual book covering, cutting, sorting and inlay procedures were considered.

We used self-made demographic information, including age, work experience, gender, education levels, marital status, work-shifts and accident history. Standardized Goldberg general health questionnaire-28 was also completed by the participants [35]. The original version of GHQ was released by Goldberg (1972) [36]. GHQ diagnosed four distress dimensions: Somatic complaints, anxiety and insomnia, social dysfunction and depression. Sub-scales had Likert system. Participants were asked to respond to each item on a 4-point scale (0-better than usual, 3-much worse than usual). A Persian version of GHQ-28 was applied. Final score of GHQ was set at 84. Lower scores meant people had a higher level of mental health. In addition, 23 and 6 were considered as cut-off points for total and sub-scales respectively [37, 38]. Many researchers have approved validity [39, 40] and reliability [41, 42] of GHQ.

After preparatory steps such as meetings with factory managers and supervisors as well as occupational specialist, workers completed the questionnaires with the help of a trained interviewer.

In addition, a check-list for safe behavior sampling was used. We developed a behavior check-list for unsafe act assessment as an observational instrument based on the literature review, consultation with experts, factory documentation and a site visit. This instrument was finalized as a list of probable unsafe acts in the factory under research [43] which contained 10 behaviors such as personal protective equipment usage, suitable posture and appropriate application of hazardous tools and machines.

In order to maintain safety in sampling and observation intervals setting, we designed a protocol. In this protocol, the first hour of the working days was specified with the number 1, the second with 2 and other similarly specified ones in throughout of work days. This is one of the mostly used methods

for safety sampling. Using a table of random numbers, a three-digit number was achieved. The first digit indicated hours, two others denoted minutes. Unattainable digits were eliminated. Notably, for having a sufficient number of observations that were required, sampling should be done every day. Also, a separate list was used for daily observations. Percentage of safe behavior in each of the subjects was determined according to the following equation [44, 45]:

$$\textbf{Safe behaviors}\% = \frac{\textbf{observed safe bahaviors}}{\textbf{observed safe and unsafe behaviors}} \times 100 \qquad \text{Eq.(1)}$$

Then to do the sampling process, work stations were defined. Then, a pilot study was designed. In this pilot study, we included 15 experts including qualified occupational specialists with the same situations. In order to determine the minimum number of observations required to conduct sampling, we calculated based on the following equation [46] taking into account the probability of safe behavior by 50 percent: The total number of required observations was attained and was equal to 400.

$$\begin{cases} N = \frac{[Z^2_{1-\alpha} P(1-P)]}{e^2} \\ \alpha = 0.01 \\ e = 0.05 \end{cases} \qquad \text{Eq. (2)}$$

Obtained data was reported as descriptive and analytical in statistics. The kolmogorov-Smirnov test was used and the results indicated a normal distribution of data; independent t-tests, ANOVA and Pearson correlation analysis were also applied (SPSS V20).

This study was approved by the ethics committee of the Qom University of Medical Sciences and all participants were given information describing the objectives and procedure of the study.

RESULTS

Totally, 80 acceptable questionnaires (out of 98) were inputted in the analysis stage so, response rated was 81.6%. Regarding this study's objectives, demographic characteristics were described at the first step. As the outcome, all personnel were males and 98.8% (79 ones) were married. Also, ages were ranging from 24 to 61 years with 41.79 as mean and 6.77 as standard deviation (SD). Mean and SD of work experience of workers were 16.52 and 5.67 years, respectively. 38 people were located in the daily work schedule and others in shift working. Participants whose educational levels were below diploma status were the majority (67.5%) and then diploma (26.2%). In addition, workers have been involved in 0.35 ± 0.813 accidents (Mean±SD) with a range of 0-5 cases. Table 1 depicts some information about educational levels and accidents. Secondly, GHQ score was calculated in order to assess relationships among variables in the next stages. Questionnaire's reliability was 0.86 by Cronbach's alpha. Alpha of social dysfunction, sleeplessness, somatic symptoms and depression was 0.87, 0.85, 0.77 and 0.88 accordingly. General health score ranged between 28 and 84 and 43.38 (±10.39) was mean (±SD). Based on information from table 2, social dysfunction had the highest score (10.50) and the worst state, on the other hand, depression had the best status. Furthermore, 32 employees (27.5%) in somatic symptoms, 25 (31.2%) in sleeplessness, 64 (80%) in social dysfunction, 9 (11.2%) in depression and all participants in total GH were in unhealthy status.

Table 1: Data around education levels and occupational accidents (n=80)

Factor	Sub-factors	Frequency (%)
Education level	Lower diploma	54 (67.5)
	Diploma	21 (26.2)
	Junior college	1 (1.2)
	Bachelor degree	4 (5.0)
Accident	Yes	17 (21.2)
	No	63 (78.8)

Table 2: GH and its subscales description (n=80)

Factors	Min.	Max.	Mean±SD
Social dysfunction	2	21	10.50±3.835
Sleeplessness	0	17	5.18±4.415
Somatic symptoms	0	19	4.66±4.118
Depression	0	16	2.04±3.777
Total GH	28	84	43.38±10.394

Researchers gathered opinions of experts about behaviors in the behavioral safety checklist (SBC) in the same situations, to assess SBC's reliability and they were 81% compatible. In order to achieve higher reliable results, we sampled behaviors two times more than the minimum required numbers. 646 behaviors (80.75%) in total were the observed ones, (800) were safe and others unsafe. 83.12% of observations of posture behavior were acceptable and had the best situation, while 40% of sampled actions around removing guard on machine was unsafe. Finally, using Pearson correlation depicted not significant relationship between general health with safe behaviors and occupational accidents (P>0.05). Correlation between sub-factors of GH with their total scores was analyzed using Pearson correlation test. Sleeplessness correlated the best (Coefficient= 0.881) and social dysfunction correlation was not

significant (P>0.05) (table 3). Various tests have been applied to evaluate the relationship between demographic factors with general health, safety behavior and accidents. General health and its scales differentiation were assessed by t-test between groups of single and married workers and day-working and shift working-staffs. Social dysfunction and total GH was different between day-working and shift-working responders (P<0.05). Furthermore, GH and its four scales and safety behaviors have been compared between workers with and without accidents experience using t-test and it was not significant (P>0.05). Also, differentiations among people with various levels of education were not statistically meaningful (P>0.05) based on ANOVA results. Fourth table shows related information around these outcomes. Relationship between GH and its scales, and safety behaviors with age, work experience, amount of training courses, and work related accidents were analyzed using the Pearson test. Age and work experience has correlated with none of factors (P>0.05).

Table 3: GH, safety behavior and accidents relationships by Pearson correlation coefficients (n=80)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Occupational accidents (1)	1							
Training courses number (2)	-0.144	1						
Somatic symptoms (3)	0.123	-0.115	1					
Sleeplessness (4)	0.145	-0.099	**0.754	1				
Social dysfunction (5)	0.171	*-0.273	*-0.225	-0.203	1			
Depression (6)	0.066	-0.081	**0.611	**0.641	**-0.387	1		
Total GH (7)	0.197	-0.218	**0.856	**0.881	0.053	**0.735	1	
Safety behavior (8)	-0.044	-0.1736	-0.099	0.001	-0.083	-0.123	-0.115	1

*P<0.05, ** P<0.01

Table 4: Comparing GH, safety behavior and accidents between different groups (n=80)

		OA	Safety behavior	Total GH	Depression	Social dysfunction	Sleeplessness	Somatic symptoms
WS[1]	DW[5]	0.45±1.01	7.92±1.31	53.16±10.41	9.87±4.56	18.68±4.36	12.76±4.91	11.84±4.18
	SW[6]	0.26±0.59	8.21±2.16	47.86±9.84	8.29±2.74	16.43±2.96	11.64±3.91	11.50±4.11
	P_{value}	0.31	0.47	*0.022	0.06	0.008**	0.26	0.72
TC[2]	Yes	0	9.00±0.00	43.62±6.57	8.12±2.10	14.38±4.31	10.88±3.40	10.25±2.96
	No	0.39±0.85	7.97±1.87	51.12±10.5	9.14±3.92	17.85±3.69	12.32±4.51	11.82±4.22
	P_{value}	0.21	0.13	0.05	0.47	*0.02	0.38	0.31
OA[3]	Yes	1.65±1.00	8.41±1.46	54.06±12.79	9.47±4.12	17.82±3.45	13.94±5.49	12.82±4.98
	No	0	7.98±1.88	49.38±9.25	8.92±3.71	17.41±3.95	11.70±3.99	11.35±3.84
	P_{value}	**0.001	0.39	0.1	0.59	0.69	0.06	0.19
EL[4]	Lower diploma	0.28±0.59	8.04±1.64	51.65±11.47	9.59±4.42	17.41±3.83	12.41±4.67	12.24±4.40
	Diploma	0.62±1. 24	7.95±2.32	47.76±7.85	7.90±1.34	17.62±4.22	11.71±4.11	10.52±3.43
	Junior college	0	8	45	8	15	11	11
	Bachelor degree	0	9.25±0.50	48.25±4.03	7.75±1.50	18.75±2.22	11.75±3.50	10.00±2.83
	P_{value}	0.31	0.62	0.47	0.32	0.83	0.92	0.35

* P<0.05, ** P<0.01 1: Work schedule/2: Training course/3: Occupational accident/4: Educational level/5: Day work/6: Shift work

DISCUSSION

Although it has been illustrated that there is no relationship between general health, safety behavior and occupational accidents (table 3), but with increase in GH score or if GH gets worse, numbers of accidents will increase by 0.2 times. Past studies confirmed this relationship [9].

Goldberg's general health questionnaire was one of the tools used in this study. Total number of the questionnaire and its scales had reliabilities between 0.77-0.88 that were desirably compared with 0.7 as an acceptable level [47]. In the present study, social dysfunction had the worst and depression had the best state and it was in line with some past researches [9, 48], also in contrast with Ghasemkhani's and *et al.* [49]. Comparing 23 as a total cut-off point, like other studies, scores are more than it [9, 26, and 27]. It means studying workers was in unhealthy conditions with regards to total GH. It seems some hazardous agents and conditions in the printing industry had roles in them [50, 51]. Some researchers like Takahashi *et al*. reported better states [52]. Lots of factors such as management style, organizational culture and issues out of the organization can cause these kinds of changes. In comparison with epidemiological studies in Iranian populations [53],

conditions in the printing industry are clearly unacceptable and interventions are required. Constructing the validity of the questionnaire is the same as that in former reports [54, 55] and it is a critical evidence for the importance of results.

GH and its scales were not different between groups of marital status and educational levels, some researchers reported the same [27]. But, some others had different outcomes regarding education [49, 56] and marital status [57]. Having children and their future and thinking about economic issues can be listed as factors causing mental problems [53]. Shift working staffs had better state than day working personnel; Zare *et al.* presented the same [9]. Probability of errors occurred [58] and then accidents [59] among people working in shift schedules was higher than in the other group, present conditions are encouraging.

Like other studies, age and work experience was not correlated with mental health. GH sub-factors, age and work experience had relationships in some researches [9, 49, and 56]. Safety behavior checklist was reliable with 81% as compatibility [3]. 19.25% of observed behaviors were unsafe in the printing industry that were matched with reported results by Noori *et al*. in a gas refinery (26.7% were unsafe) [44]. Mohammadfam *et al.* assessed safety behaviors in a gas refinery in Iran and presented 36.7% of behaviors as unsafe [45]. Other researches belonging to Azadeh *et al.* in steel manufacturing company have reported that 41.8% of total behaviors were unsafe [60]. Based on the above-mentioned studies and also other ones [61], results of the present study that majority of behaviors (more than 80%) were safe, could say safety behavior is desirable.

Despite the relationship between work-related accidents and safety behaviors was not acceptable and it was in contrast to some studies, there are studies that did not declare relationships between them [62]. A few numbers of accidents, limited distribution of workers with respect to age and work experience are some reasons for the insignificant relationships and contrasts with past reports. Conducting researches on a bigger scale in order to eliminate ambiguity that resulted from the power of the study was recommended.

CONCLUSION

Although relationships between mental health, safety behavior and accidents were not approved, studied employees were in unhealthy state of general health and its social scale of function. As people of mental health are in relation with lifestyles [63] and sleep quality [64], improvement in health behaviors such as review in lifestyles can help to promote workers' mental health. In addition, better physical conditions in the workplace will lead to better workers' health state.

On the other hand, notwithstanding that accidents and unsafe behaviors are not alarming, but managers can improve behaviors by the use of ABC (Activators-Behaviors-Consequences) model [65]. Have meetings around occupational safety and health issues involving employees (can be planned in various work departments); stating objectives, rules and regulations, policy, and applied procedures, training and easy communications are good activators. Intrinsic satisfaction, good working reward system, and individual conformances are consequences that need attention in order to move an organization to a zero accident workplace.

ETHICAL ISSUES

The Qom University of medical sciences ethics committee approved the study protocol. Also researchers explained all procedures and requirements for participants. They voluntarily approved a consent form before enrolling in the study.

CONFLIC OF INTEREST

There are no conflicts of interest.

AUTHORS' CONTRIBUTIONS

All authors equally help to write this manuscript.

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