Original Article

Health-Related Quality of Life and Associated Factors among the Staff at an Iranian Petrochemical Complex

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Abstract

Background: Health-related quality of life (HRQOL) had not previously been investigated for Bandar Imam Petrochemical Complex (BIPC) staff members, who often work in dangerous conditions. The present study examined the relationships of several socio-demographic and health-related characteristics with dimensions of HRQOL for BIPC employees.

Methods: In this cross-sectional study, 370 BIPC employees filled out a paper-and-pencil questionnaire, including questions on sociodemographic characteristics (e.g., gender, marital status, educational level, type of employment, and job tenure), measures of health status (e.g., blood pressure, blood fat, and blood sugar), smoking, and HRQOL. The Persian version of SF-36 was applied to assess HRQOL.

Results: The mean values for the physical functioning, bodily pain, general health, physical role, vitality, mental health, and emotional role domains of HRQOL indicate that the employees' HRQOL is relatively good. Multiple linear regressions revealed that the employees' HRQOL scores decreased with increasing age and educational level. Furthermore, the HRQOL scores were lower for male, single, or part-time employees; for those who had worked at BIPC for more than five years; and for those who were in bad health or who smoked. Among the considered variables, smoking had the strongest negative association with HRQOL.

Conclusions: BIPC employees' HRQOL is relatively good. Furthermore, sociodemographic factors and health are strongly associated with their HRQOL scores. Future petrochemical companies' health studies and risk-adjustment models should adjust for these sociodemographic and health factors when assessing the performance of health care programs.

Keywords: Quality of life, Petrochemical employees, Iran

Introduction

The petrochemical industry is a crucial part of modern life, as its products are used to meet important human needs, including health, well-being, quality of life (QOL), and food. However, it is inventive, commercial, and continuously adjusting to new conditions. Petrochemicals usually pose a greater hazard to health than to property. Doubts about how, to what extent, and when a danger might harm employees' well-being constantly arise (Flynn et al., 1994; Osei et al., 1997). To date, policies within the Iranian petrochemical sector are not concerned with health and health care interventions, which affects both the individual and public quality of life. QOL is an essential part of each person's life, and it is a multidimensional facet that has an effect on every aspect of a person's life. It associates to persons' opinions about their position in life, taking into account the background and value systems in which they live, and in relation to their goals, expectations, values and worries (Canavarro et al., 2009). Based on the World Health Organization (WHO) definition, QOL can be understood how healthy, happy and pleased somebody is with his/her life that may depend on the individual's aims in life, culture, and education (Felce & Perry, 1995). Health-related QOL (HRQOL) has also been applied to describe an individual's perceived physical and mental health over time (Watanabe et al., 2008; Zhu et al., 2012). Mental, physical and social health are dimensions linked to an individual's HRQOL (Aalto et al., 2006). Studies have presented that many factors, including age, sex, the level of education, marital status, lifestyle behaviours, and health situation significantly have effects on HRQOL (Hong et al., 2015; Zhu et al., 2013; Wu et al., 2011).

Work is another important issue of HRQOL that has been increasingly recommended in studies to include as determinants, because associations were found between work-related diseases and QOL (Nedjat et al., 2011; Yu et al., 2008). Many aspects of work, including the burden caused by physical work, healthy working settings, and type of job (part-time or full-time) have been shown to

be associated with HRQOL (Oliveira & de Oliveira, 2011; Silva et al., 2010; Edimansyah et al., 2007) the effects of other features of work-related factors on HRQOL such as occupational stress, job-related accidents and job-related hazards have been less studied. Taking into account the difficult and hazardous work conditions of petrochemical staff, it is possible that the effects of these conditions influence various aspects of employees' life, like their HRQOL (Edimansyah et al., 2007; Oliveira D and de Oliveira, 2011; Silva et al., 2010). However, the HRQOL effects of other work-related factors, such as occupational stress, job-related accidents, and job-related hazards, have been less studied. The difficult and hazardous work conditions that petrochemical staff members endure may influence various aspects of employees' lives, including their HRQOL. However, studies concentrating on petrochemical employees' QOL dimensions are scarce. To the best of our knowledge, the HRQOL of Iranian workers in the Bandar Imam Petrochemical Complex (BIPC) has not been studied. In light of the relevance of the petrochemical sector and the high illness rates for workers in that sector, the aims of the present study are, first, to examine the HRQOL of petrochemical staff members at that complex, which is in the city of Mahshahr, and second, to explore the associations between sociodemographic factors, health conditions, and HRQOL.

Method

Study design and participants

For this cross-sectional study, between April and July 2015, we randomly selected a sample of 370 staff members from Bandar Imam Petrochemical Complex (BIPC) in Mahshahr, Iran. Inclusion criteria were those who (a) had worked at BIPC, (b) had no coexisting chronic debilitating diseases (e.g., stroke or epilepsy), (c) had no audiovisual or psychological problems, (d) resided in Mahshahr region, and (e) agreed to complete a paper-and-pencil questionnaire. We explained the purpose of the study and the participants' rights as human subjects to the participants, and all participants signed consent forms. Ethical approval was granted by the Ethics Committee of Ahvaz University of Medical Sciences and the research center of BIPC.

Measure

To collect data, we administered a paper-and-pencil questionnaire that included a demographic data form comprising questions related to the employees' socio-demographic characteristics : age, gender, educational level (under-diploma, diploma, associate degree and bachelordegree), marital status (single/married), job tenure (below or above 5 years), type of employment (formal versus contractual), type of work (part time or full time), health status, and smoking (no/yes) and the Persian version of the Short-Form 36 (SF-36) as HRQOL measure. The first questions asked about sociodemographic characteristics and health conditions; the SF-36 questions were included afterward. To prevent participants from having difficulties understanding the items, the assessment was conducted by means of a structured interview.

SF-36 Quality of life questionnaire

The SF-36 is one of the most widely used HRQOL instruments, and it has been validated in various languages. The SF-36 has eight scales, which measure eight domains of HRQOL: physical functioning (PF, 10 items), bodily pain (BP, 2 items), general health (GH, 5 items), role limitations due to physical problems (RP, 4 items), social functioning (SF, 2 items), vitality (VT, 4 items), mental health (MH, 5 items), and role limitations due to emotional problems (RE, 3 items). The first four subscales examine physical health and are summarized in the physical component score. The latter four subscales examine mental health and are summarized in the mental component score. Item scores for each dimension are coded, summed, and transformed to match a scale from 0 (worst possible health status) to 100 (best possible health status). In other words a higher score indicates a better HRQOL. Scores below 33 are weak, those between 34 and 68 are moderate, and those above 68 are good. For the Iranian version of the SF-36, acceptable internal consistency (Cronbach's alpha coefficients ranging from .77 to .90) has been reported for the different dimensions, and both convergent and discriminant validities have been reported above .40 ranging from 0.58 to 0.95 (Montazeri et al., 2005).

Statistical analysis

We performed statistical analyses using IBM SPSS software for Windows (version 21.0, IBM Co.). We first examined the descriptive characteristics of the study sample using χ^2 tests, t-tests and univariate analyses of variance (ANOVAs) to examine the effects that the sociodemographic characteristics had on each domain of HRQOL. Then, we performed linear regression analyses to examine the associations between the sociodemographic variables, the health variables, and the SF-36 domains. The model retained independent variables with $p \leq 0.05$.

Results

The sociodemographic characteristics and health-related variables of study participants are shown in Table 1. Overall, 92% of participants were male, 93% were married, and their mean age was 40.02 years (SD = 8.00; range = 19-62). The mean length of job tenure was 15.00 years (SD = 7.03; range = 1-37). Thirty-eight percent of the participants worked part-time, 35% had a college degree, and 65% had no disease. The mean BMI was 24.90 (SD = 3.08). The participants' descriptive statistics for each domain of the HRQOL are shown in Table 2.

1. Physical Function Domain Results: The participants' mean score in the PF domain was 80 (SD = 23). The results of the univariate ANOVAs showed that PF significantly varied with age, gender, educational level, marital status, type of work, employment status, job tenure, smoking habits, and health condition. All of the following indicated that lower PF is associated with higher age, male gender, lower educational level, single marital status, part-time work, formal employment status, job tenure of more than five years, smoking, and having a disease.

2. Role-Limitations due to Physical Problems Domain Results: The participants' mean score in the RP domain was 69 (SD = 34). The results of the univariate ANOVAs revealed that RP scores significantly varied with age, gender, educational level, marital status, type of work, employment status, job tenure, smoking habits, and health condition. All of the following indicated lower RP: higher age, male gender, lower educational

level, single marital status, part-time work, formal employment status, job tenure of more than five years, smoking, and good health.

3. Bodily Pain Domain Results: The participants' mean score in the BP domain was 77 (SD = 22). The results of the univariate ANOVAs indicated that BP scores significantly varied with age, gender, educational level, marital status, type of work, employment status, job tenure, smoking habits, and health condition. All of the following indicated lower BP: higher age, male gender, higher educational level, single marital status, part-time work, formal employment status, job tenure of less than five years, not smoking, and having a disease.

4. General Health Perception Domain Results: The participants' mean score in the GH domain was 67 (SD = 15). The results of the univariate ANOVAs revealed that GH scores significantly varied with age, gender, educational level, marital status, type of work, employment status, job tenure, smoking habits, and health condition. All of the following indicated lower GH: lower age, male gender, lower educational level, single marital status, part-time work, informal employment status, job tenure of less than five years, smoking, and having a disease.

5. Vitality Domain Results: The participants' mean score in the VT domain was 69 (SD = 16). The results of the univariate ANOVAs indicated that VT scores significantly varied with age, gender, educational level, marital status, type of work, employment status, job tenure, smoking habits, and health condition. All of the following indicated lower VT: higher age, female gender, higher educational level, single marital status, part-time work, formal employment status, job tenure of less than five years, not smoking, and good health.

6. Social Functioning Domain Results: The participants' mean score in the SF domain was 78 (SD = 19). The results of the univariate ANOVAs demonstrated that SF scores significantly varied with age, gender, educational level, marital status, type of work, employment status, job tenure, smoking habits, and health condition. All of the following indicated lower

SF: lower age, female gender, lower educational level, single marital status, part-time work, informal employment status, job tenure of less than five years, smoking, and having a disease.

7. Role-Emotional Domain Results: The participants' mean score in the RE domain was 75 (SD = 33). The results of the univariate ANOVAs showed that RE scores significantly varied with age, gender, educational level, marital status, type of work, employment status, job tenure, smoking habits, and health condition. All of the following indicated lower RE: lower age, female gender, lower educational level, single marital status, part-time work, formal employment status, job tenure of more than five years, smoking, and having a disease.

8. Mental Health Domain Results: The participants' mean score in the MH domain was 71 (SD = 17). The results of the univariate ANOVAs indicated that MH scores significantly varied with age, gender, educational level, marital status, type of work, employment status, job tenure, smoking habits, and health condition. All of the following indicated lower MH: lower age, male gender, lower educational level, single marital status, part-time work, formal employment status, job tenure of more than five years, smoking, and having a disease.

9. Multiple Linear Regression Analysis: The results of the multiple linear regression analyses were applied to examine the associations between the sociodemographic variables, the health factors, and the scores on each of the HRQOL domains (see Table 3). There are some differences among the eight domains regarding the predictive value of the sociodemographic and health variables. Among the included variables, smoking had the highest standardized regression coefficients, with $\beta_{GH} = -.271$, $\beta_{BP} = -.184$, $\beta_{SF} = -.132$ $\beta_{MH} = -.217$ and $\beta_{RP} = -.15$. The results of the analyses also demonstrated that the explained variance (adjusted R^2)was the highest for the RP domain and the lowest for the SF domain, with $R^2_{PF} = 35\%$, $R^2_{RP} = 47\%$, $R^2_{RE} = 29\%$, $R^2_{VT} = 33\%$, $R^2_{MH} = 23\%$, $R^2_{SF} = 11\%$, $R^2_{BP} = 15\%$, and $R^2_{GH} = 18\%$.

Table 1. Scio-demographic and health-related factors of the study participants and HRQOL scores among different subgroups (n= 370).

Characteristics		N(%)	PF Mean (SD)	p-value	BP Mean (SD)	p-value	GH Mean (SD)	p-value	RP Mean (SD)	p-value	SF Mean (SD)	p-value	VT Mean (SD)	p-value	MH Mean (SD)	p-value	RE Mean (SD)	p-value	PCS Mean (SD)	p-value	MCS Mean (SD)	p-value
Age	≤29	34	83(19)		76(21)		72(14)		76(28)		76(20)		70(14)		73(16)		76(31)		77(15)		73(16)	
	30-39	140	77(25)	0.04	77(23)	0.001	66(16)	0.001	67(35)	0.001	77(20)	0.001	66(16)	0.001	72(16)	0.001	76(34)	0.001	72(18)	0.001	72(16)	0.001
	≥40	196	81(23)		78(21)		66(15)		69(34)		79(18)		70(16)		74(16)		75(33)		73(17)		74(16)	
Sex	Female	32	88(16)	0.004	82(17)	0.001	72(13)	0.04	82(31)	0.001	80(19)	0.001	63(15)	0.04	66(15)	0.001	79(33)	0.02	81(14)	0.003	72(16)	0.001
	Male	338	78(23)		77(22)		66(22)		67(34)		78(19)		69(16)		70(17)		75(33)		72(18)		73(16)	
Marital	Single	28	86(17)	0.04	82(22)	0.001	71(18)	0.001	73(31)	0.001	78(21)	0.001	69(16)	0.001	68(18)	0.001	78(32)	0.001	78(16)	0.001	73(15)	0.001
	Married	342	79(23)		77(22)		66(15)		68(34)		78(19)		69(16)		70(17)		75(33)		73(17)		73(16)	
Educational Level	Under-Diploma	108	74(26)		72(26)		64(16)		61(34)		75(20)		66(17)		68(19)		70(32)		67(20)		70(17)	
	Diploma	129	78(22)	0.001	78(21)	0.01	66(15)	0.003	66(35)	0.002	78(19)	0.001	69(15)	0.001	69(16)	0.04	75(34)	0.001	72(16)	0.001	73(15)	0.03
	Associate-Degree	49	88(15)		80(19)		73(13)		79(31)		79(19)		71(16)		72(17)		75(36)		80(15)		74(18)	
	Bachelor	84	79(23)		82(18)		68(14)		76(31)		81(17)		69(16)		74(14)		82(32)		78(15)		77(15)	
Type of Employment	Formal	269	81(21)	0.04	77(20)	0.001	65(15)	0.001	67(34)	0.04	79(19)	0.001	69(15)	0.001	71(16)	0.001	75(35)	0.001	72(17)	0.02	73(17)	0.001
	Contractual	101	83(20)		81(19)		69(14)		76(30)		80(17)		70(16)		71(16)		76(30)		77(15)		75(15)	
Type of Work	Part time	142	80(24)	0.001	81(21)	0.02	68(15)	0.001	67(37)	0.001	80(19)	0.001	71(17)	0.04	71(18)	0.001	77(34)	0.001	74(19)	0.001	75(17)	0.001
	Full time	228	79(22)		75(22)		66(15)		69(32)		77(18)		68(15)		69(16)		74(33)		72(17)		72(16)	
Job Tenure (yr)	≤5	39	70(21)	0.03	77(21)	0.001	71(12)	0.004	53(12)	0.007	77(14)	0.001	82(27)	0.001	49(10)	0.001	71(23)	0.009	61(14)	0.001	65(21)	0.004
	>5	331	74(24)		72(20)		75(14)		62(16)		78(15)		86(22)		55(18)		68(26)		62(14)		69(26)	
Health Statues	Blood pressure	15	84(18)		70(26)		62(21)		60(35)		75(17)		65(18)		68(18)		80(32)		69(19)		72(17)	
	Blood fat	59	75(27)	0.01	78(20)	0.001	65(16)	0.04	63(38)	0.01	79(20)	0.01	67(18)	0.001	65(17)	0.009	71(37)	0.001	70(20)	0.005	71(19)	0.002
	Diabetes	8	81(30)		79(24)		70(8)		46(47)		81(16)		70(10)		75(11)		50(39)		69(21)		69(15)	
	Healthy	288	82(21)		78(21)		68(15)		73(32)		79(19)		70(16)		72(17)		80(29)		75(17)		75(15)	
Smoking	Yes	44	70(22)	0.002	72(23)	0.001	62(14)	0.004	60(35)	0.001	69(17)	0.02	67(14)	0.003	68(16)	0.004	59(40)	0.005	66(16)	0.001	65(15)	0.007
	No	336	71(21)		79(21)		67(14)		63(32)		72(14)		65(12)		69(15)		64(37)		68(17)		68(14)	

Table 2. Descriptive statistics of the domains of the SF-36

	Raw Score n = 370		Normalized Score n = 370	
	Mean	SD	Mean	SD
Physical functioning (PF)	26	4	80	23
Role limitations due to physical problems (RP)	6	1	69	34
Bodily pain (BP)	8	1	77	22
General health (GH)	18	3	67	15
Vitality (VT)	17	3	69	16
Social functioning (SF)	8	1	78	19
Role limitations due to emotional problems (RE)	5	1	75	33
Mental health (MH)	22	4	71	17
Overall HRQOL	95	12	74	15

Table 3. Associations between sociodemographic characteristics, health-related factors and HRQOL domains (n = 370).

	β*	SE	t	p-value
PF				
Sex (ref = female)	-.07	4	-1	.000
Marital status (ref = single)	-.04	4	-0.000	.000
Educational level (less than a diploma vs. bachelor's degree)	-.001	1	-2	.003
Employment (ref = contractual)	.003	0.001	1	.001
Type of work (ref = part-time)	-.05	3	-1	.000
Job tenure (≤5 years)	.01	4	1	.001
Health (ref = healthy)	-.04	0.000	-0.000	.001
Smoking (ref = no)	-.06	1	-2	.003
RP				
Sex (ref = female)	-.06	6	-1	.001
Educational level (less than a diploma vs. bachelor's degree)	-.002	1	-3.06	.002
Employment (ref = contractual)	.13	4	1	.000
Type of work (ref = part-time)	-.073	2	-1	.000
Job tenure (≤5 years)	.01	1	1	.000
Health (ref = healthy)	-.001	1	-2.055	.041
Smoking (ref = no)	-.15	2	-1.4	.002
RE				
Educational level (less than a diploma vs. bachelor's degree)	.175	1	2.09	.03
Employment (ref = contractual)	.126	2	2	.000
Type of work (ref = part-time)	-.101	1.077	-2	.014
Health (ref = healthy)	-.099	1	-1	.04
VT				
Age	-.079	1	-1	.000
Sex (ref = female)	-.129	3	-2.09	.003
Marital status (ref = single)	-.021	1	-1	.000
Educational level	.099	1	1.12	.04

(less than a diploma vs. bachelor's degree)

MH

Marital status (*ref* = single)	-.145	1	-1	.003
Educational level	-.024	1	-2	.014
(less than a diploma vs. bachelor's degree)				
Health (*ref* = healthy)	-.192	2	-2.089	.037
Smoking (*ref* = no)	-.217	1	-1	.002
SF				
Employment (*ref* = contractual)	.129	1	1	.007
Type of work (*ref* = part-time)	-.085	2.063	-1	.000
Job tenure (≤5 years)	.098	3	1.03	.02
Health (*ref* = healthy)	-.042	1	-1	.000
Smoking (*ref* = no)	-.132	1	-1	.000
BP				
Sex (*ref* = female)	-.083	4	-1	.000
Employment (*ref* = contractual)	-.043	1	-1	.000
Type of work (*ref* = part-time)	-.131	1	-2	.015
Job tenure (≤5 years)	-.072	1	-1	.02
Health (*ref* = healthy)	-.033	1	-1	.001
Smoking (*ref* = no)	-.184	1	-2	.000
GH				
Age	-.015	1	-1	.000
Sex (*ref* = female)	-.52	3.049	-1	.000
Marital status (*ref* = single)	-.039	3	-1	.000
Educational level	-.111	1	-1	.04
(less than a diploma vs. bachelor's degree)				
Health (*ref* = healthy)	-.089	1	-1	.009
Smoking (*ref* = no)	-.271	1	-1	.003

*Standardized regression coefficients derived from a multivariate linear regression.

Discussion

We carried out this cross-sectional study to increase our understanding of how HRQOL and related factors affect workers at BIPC. HRQOL refers to perceptions of a person's physical and mental well-being, and it is associated with chronic disease and lifestyle risk factors (Tsai, 2012). Information on HRQOL is important because it may be used in decision-making processes regarding work-related health.

In this study, we found that the participants' overall mean HRQOL score was 74. The lowest scores were found in the RP, GH, and VT domains. One explanation for these results is that BIPC employees are exposed to industrial chemical substances that affect RP, GH, and VT. These findings are partially consistent with other studies. For instance, one study found that the

participants' scores on all physical subscales of the SF-36 were normal, but that their mental subscale scores were negatively impacted by age (Engelberts et al., 2002). In another study, women had higher PF scores than men (Leidy et al., 1999).

HRQOL can be affected by various factors. To explore the factors associated with the eight dimensions of the SF-36, we applied multivariate regressions. The results indicated that all of these factors were significantly associated with employees' HRQOL: age, gender, educational level, marital status, job tenure, type of employment, type of work, health status, and smoking. With regard to age and job tenure, our findings are consistent with a study conducted by Nabirye (2011), who found that older nurses (those with more than 20 years of work

experience) reported higher stress levels than younger nurses (Nabirye et al., 2011).

The findings of the present study revealed a positive association between level of education and all domains of HRQOL. This finding can be explained by the fact that persons with higher education often have better occupational positions, higher incomes, and better socioeconomic conditions; all these factors affect HRQOL. Reducing work-related risk factors can thus result in higher HRQOL. In the current study, we found that the type of employment was significantly associated with all dimensions of HRQOL. Additionally, our results indicated that working either part-time or full-time could improve participants' HRQOL. This finding is consistent with some earlier studies. Gordon et al (Gordon et al., 1986) found that part-time workers experienced higher levels of work pressure and more emotional difficulties than did full-time workers. Nakata found that full-time work was related to lower risk of depression (Nakata, 2011) and work damage (Nakata, 2011), but inversely related to self-rated health (Nakata, 2012). The reason for this result may be that formal workers have greater self-esteem due to their higher income and fixed work. Even if contractual workers and formal workers receive an equal amount of salary, contractual workers get less welfare aid, which can lead to lower QOL. Working in a steady position may also affect one's self-esteem. Unfortunately, few available studies have applied HRQOL based on type of employment (Aberg et al., 2009). It might be interesting for future studies to further examine these effects. Women desired the part-time work due to the home responsibility, and women wanted to take part earning income to help household income (Hsu & Kernohan, 2006).

The present study has some limitations. Given the study's cross-sectional design, its findings do not allow the investigators to establish causal relationships between sociodemographic variables and HRQOL. A longitudinal study design may be necessary to enhance knowledge of the causal processes; studies with larger samples are required to determine the relationships between HRQOL and sociodemographic variables. Furthermore, the present sample consisted solely of petrochemical complex workers from the same province of Iran, so the results cannot be generalized to all Iranian petrochemical workers. Similarly, generalization may be limited because the mean age of the participants was relatively young (40 years) and because a strong majority of the participants were men (238 men versus 32 women). It thus might be interesting for future studies use larger samples.

Conclusion

In conclusion, the results of the current study indicated that the petrochemical employees had relatively high levels of HRQOL. The factors associated with the SF-36 dimensions were age, gender, educational level, marital status, job tenure, type of employment, type of work, health condition, and smoking. To improve the health of petrochemical complex employees, their sociodemographic, work-related, and health-related factors must be consistently managed via the development of policies and health promotion programs.

Acknowledgments

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