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ORIGINAL ARTICLE

Relationship between depression and socio-demographic and illness characteristics in arsenicosis population of Bangladesh

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Abstract

A community based cross-sectional study was carried out by a self-structured questionnaire on 168 participants aged between 18 and 60 years at two arsenic prone area of Bangladesh to determine the association between extent of depression and socio-demographic as well as illness characteristics in arsenicosis population. The mean age ± SD was 42 ± 10.15 years. Female respondents were almost twice (63.1%) than the males (36.9%) in this study. Most of the respondents (94.0%) were shallow tube well water user. Among them most (80.0%) of the respondents were detected as arsenic contaminated water consumer over more than six months. Study estimated that almost half (44.3%) of the participants had suffered from mild to moderate depression in the moderate arsenicosis group. Less than quarter (20.8%) participants suffered severe depression in severe arsenicosis group. Quarter (26.7%) had mild arsenicosis with no depression. This difference was not significant. Gender had significant influence on proportion of level of depression. Females significantly suffered more from depressive symptoms than males. More than two third of the female respondents suffered from some kind of depressive symptoms; where less than one third of the males were suffered from depressive symptoms. Age has no significant relation with depression. Respondents who were 48 years and above age group had highest percentages of severe depressive symptoms (35.8%). This age group also suffered from highest percentage of mild to moderate depression (37.1%). Though most of the respondent (85.1) had no diabetes and hypertension. Respondents with physical illness suffered more from some sorts of depression than those without illness, but the result is not statistically significant. We understood that depression has health challenges in adult arsenicosis patients. Therefore, physicians should take account depression in their treatment management when deal with arsenicosis patients.

Keywords: *Depression, arsenic, arsenicosis, age, gender hypertension, diabetes, Bangladesh*

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Introduction

Before 90s, rural population of Bangladesh used pond or small river as a means of drinking water and suffered from severe diarrhea due to bacterial contamination of surface water. The government with the help of international donor agencies (i.e., World Bank, United Nations Children's Fund) installed millions of shallow tube wells to provide groundwater in rural Bangladesh for safe drinking water. However, in 1993, it was discovered that these shallow tube wells are contaminated with geologically derived arsenic [1]. As a result, 50 million of people of 61 out of 64 districts of rural Bangladesh was exposed to inorganic arsenic (As) as a means of contaminating drinking water from these shallow tube wells [2]. Of 24 million people were suffered from severe form of arsenicosis that was the greatest disaster in the world [2]. Risk of arsenic poisoning in the population were increasing every day. Studies from US, Chile, Argentina, Mexico, Taiwan, Mongolia, West Bengal, India reported to health hazard of arsenic exposure from drinking water and most recently Bangladesh [2]. Over 100 million people in the world are suffered to As through drinking water. Chronic exposure to As in drinking water has been found relationships to many diseases, as for example skin cancer, lung, bladder, liver and kidney diseases, cardiovascular (ischemic heart disease, hypertension, stroke), endocrine (diabetes mellitus), hepatic, gastrointestinal, reproductive problems, cancer and neurodevelopmental (peripheral neuropathy, cognitive development) disorders [3-9]. Long time exposure through drinking arsenic-contaminated water affects all organs and systems of the body [8,9]. However, no report is available from arsenic toxicity on mental health specially depression and associated social consequences.

Depression is serious mood disorder causes negative feelings of self. The common symptoms of depression are loss of interest or pleasure, feelings of guilt or low self-esteem, no interest toward the external environment, tendency of suicide, sleep disorder (insomnia or spleen more), loss of appetite, and poor concentration. Chronic depression hamper to take care of everyday responsibilities by themselves [10]. According to World Health Organization (WHO), depression is the leading cause of disability as calculated by YLDs (Years Lost Due to Disability) and the 4th leading cause of the global burden of disease as measured by DALYs (Disability Adjusted Life Years) in 2000 [10]. If the forecast is true, by 2030, depression will be the second cause of the global disease burden.

Inadequate data are available on depression especially from arsenicosis patients in the general population in South Asia [10]. Bangladesh is not behind the scenario. Association of depression with arsenicosis in different cultural settings must be addressed. These facts had influenced us to examine depression among the arsenic endemic area. This study also estimated the extent of depression in arsenicosis population and relationship between depression of arsenicosis patients and socio-demographic characteristics of the respondents in Bangladesh. We assessed relationships of hypertension and diabetes with depression in arsenicosis patients as well.

Materials and Methods

A community based cross-sectional study was carried out by a self-structure questionnaire on 168 people at arsenic prone area of Nilkanda and Banglabazar village, Sonargaon, Narayanganj District of Bangladesh. Adult participants, age between 18 to 60 years were taken to determine the extent of depression in arsenicosis patients and socio-demographic and illness factors associated with it. Following socio-demographic factors were compared e.g., age, gender, education, marital status, family orientation and illness (hypertension and diabetes). Sample were taken purposively.

Ethical clearance was obtained from Sir Salimullah Medical College Ethical Review Committee. Consent was received from each individual prior to inclusion in the study. Participant had right to withdraw from the study at any stage. Confidentiality concerning their information were maintained strictly.

Self-structure questionnaire was developed in accordance with specific objectives. The questionnaire had 40 questions including: 1) socio-demographic characteristics, 2) illness characteristics, and 3) depression related information. Questionnaire was validated by a pre-test on 10 people in Monarbagh village under Sonargaon Upazia, Narayanganj district. Necessary modification was done according to their feedback and happy facial expression of participants with the questonaires. Data were collected through face-to-face interview. Study was elaborately explained to each prospective participant before the data collection start.

Depression status was assessed by Centre for Epidemiological Studies Depression (CES-D) scale. A Bangla version of CES-D was developed

according to Tsutsumi et al. to measure depression among arsenicosis patients of Bangladesh [11]. The CES-D score was used to understand mean of total depression score association with the discussing variables. Generally, cut-off value was used as 16 to identify respondents with clinically significant level of depression. Cut-off value were considered as <16 (no depression), 16-21 (mild to moderate depression) and ≥ 22 (severe depression) [12].

Arsenicosis was diagnosed from the record of Upazila Health Complex of Sonargaon Upazila, Narayanganj district. Documents of the respondents were reviewed for physical and psychological illness diagnosed by the physicians and Severity of arsenicosis were categorized according to WHO criteria.

The age of the respondents was divided into four groups with 10 years' interval. a) 18-27 years b) 28-37 years c) 38-47 years and d) 48 years and above.

After collection of all the information, data were checked, cleaned and edited. An analysis plan was developed according to objectives of the study. Data were analyzed using MS-Excel 2007, SPSS-16 version and Chi-square was done to compare level of arsenicosis and severity of depression. $P < 0.05$ was considered as statistically significant.

Results

Demography

The mean age ± Standart Deviation (SD) of respondents

Table 1. Demographic information (n=168)

Age group (yrs)	**n (%)**
18-27	14 (8.3)
28-37	42 (25.1)
38-47	56(33.3)
48 and above	56(33.3)
Sex of the respondents	
Male	62(36.9)
Female	106(63.1)
Marital status	
Married	136(81.0)
Unmarried	32(19.0)
Educational qualification	
Illiterate	60(35.8)
Primary	62(36.9)
Secondary	34(20.2)
Higher secondary and above	12(7.1)
Occupation	
Service holder	9(5.4)
Agricultural work	17(10.1)
Businessman	24(14.3)
Day laborer	19(11.3)
House wife	99(58.9)
Income level BDT	
<5000	55(32.7)
5000-10000	68(40.5)
≥10000	45(26.8)

Table 2. Sex of the respondents with severity of arsenicosis (n=168)

Gender		Severity of arsenicosis			χ^2	df	P
		Mild Arsenicosis n (%)	Moderate Arsenicosis n (%)	Severe Arsenicosis n (%)			
Gender of the respondents	Male	10 (16.1%)	33(53.2%)	19 (30.6%)	7.40	2	.240 n s
	Female	38 (35.8%)	42 (39.6%)	26 (24.5%)			

were 42 ±10.15 years & range between 21-60 years. Both age groups of 38-47 and 48 and above years had the highest portion of the respondents (33.3%) and quarter (25.0%) respondents had from age group of 28 to 37 years. Female respondents were almost twice (63.1%) than the males (36.9%). Most of the respondents (81%) were married. Education level of respondents were illiterate (35.8%), primary education (36.9%), secondary education (20.2%) and higher secondary and above (7.1%) respectively. More than half (58.9%) of the respondents were housewives followed by businessmen (14.3%) and service holder (5.4%). Forty percent respondents had monthly income between 5000-10000 taka. (Table 1).

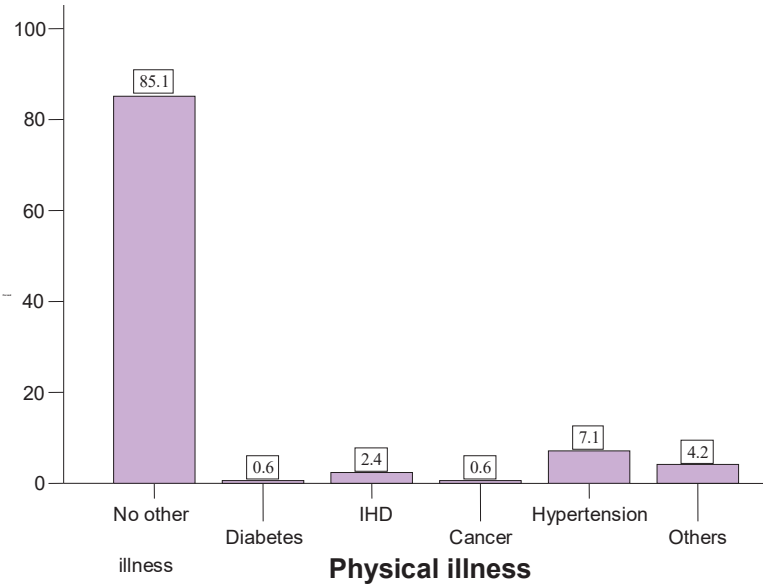

Figure 1. Distribution of respondents by physical illness

Source and duration of arsenic contaminated water

Most of the respondents (80.8%) used to consume arsenic contaminated water more than six months. Other had used tube deep well water.

Arsenic Patients

Females had suffered more arsenicosis than males. Among the study subjects (39.6%) female had developed moderate arsenicosis followed by severe arsenicosis (24.5%). In case of male, subjects (53.2%) had developed moderate arsenicosis and (30.6%) developed severe arsenicosis. But these differences were statistically not significant (p<0.240) (Table 2).

Physical illness

Most of the respondents (85.1%) were free from any sort of diagnosed physical illness and rest had physical illness (14.9%) like Hypertension, DM, and

Depression level

The Mean ≥ SD score of depression was 19.7 ≥ 7.90. Among the respondents, (71.4%) had suffered from some level of depression (CES-D score ≥ 16). About half of the study subjects (41.7%) suffered from mild to moderate depression followed by (31.5%) respondents had severe depression. No depression had (26.8%) cases (Figure-2).

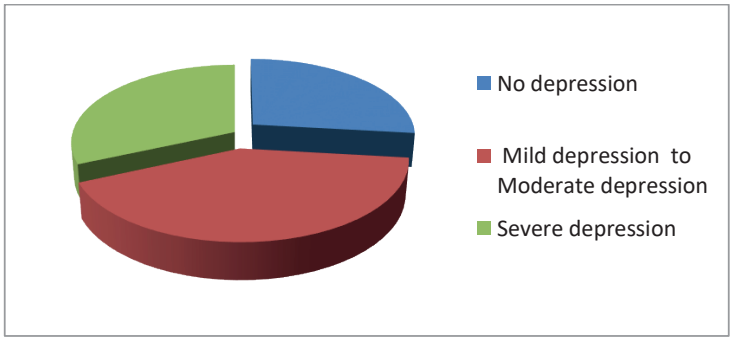

Figure 2. Level of depression among respondents

Table 3: Severity of arsenic with level of depression (n=168)

Depression level	Mild Arsenicosis n (%)	Moderate Arsenicosis n (%)	Severe Arsenicosis n (%)	χ^2	df	P value
No depression	12(26.7%)	20(44.4%)	13(28.9%)	1.86	4	0.760 ns
Mild to moderate depression	18(25.7%)	31(44.3%)	21(30.0%)			
Severe depression	18(34.0%)	24(45.3%)	11(20.8%)			

Table 4. Sex of the respondents and level of depression (n=168)

Characteristic	**Level of depression**			**Total n (%)**	χ^2	**df**	**p value**
Sex	No depression n (%)	Mild to Moderate depression n (%)	Severe depression n (%)				
Male	23(51.1)	20(28.6)	19(35.8)	62(36.9)	6.013	2	0.049*
Female	22(48.9)	50(71.4)	34(64.2)	106(63.1)			

Table 5. Age of the respondents and level of depression (n= 168)

Characteristic	**Level of depression**			χ^2	**df**	**p**
Age (in years)	No depression n(%)	Mild to Moderate depression n (%)	Severe depression n (%)			
18-27	8(17.8)	4(5.7)	2(3.8)	8.500	8	0.093 ns
28-37	12(26.7)	16(22.9)	14(26.4)			
38-47	14(31.1)	24(34.3)	18(34.0)			
48 and above	11(24.4)	26(37.1)	19(35.8)			

Severity of arsenic with level of depression

In mild to moderate arsenicosis group (44.3%) had suffered moderate depression In severe arsenicosis group had suffered severe form of depression and (26.7%) had mild arsenicosis had significantly no depression. This deference was not statistically significant (p>0.05) (Table 3).

Depression and Gender

Females were suffered significantly more from depressive symptoms than males. More than two third of the female respondents were suffered from depressive symptoms; whereas less than one third of the males were suffered from depressive symptoms. Females were suffering more from both mild to moderate and sever form of depression than males (mild to moderate 71.4% vs. 28.6% and severe form of depression 64.2% vs. 35.8%). Sex had significant influence on proportion and level of depression (p<0.05) (Table 4).

Depression and age

Respondents who were 48 and above year's age

Table 6. Physical illness and level of depression (n= 168)

Physical illness	Level of depression			Total	χ^2	*df*	*p*
	Mild Arsenicosis n(%)	Moderate Arsenicosis n(%)	Severe Arsenicosis n(%)				
No	42(29.4)	58 (40)	43 (30.1)	143 (85.1)	0.188	2	.188 ns
Yes	3(12.0)	12 (48.0)	10 (40.0)	25 (14.9)			

group had highest percentages of severe depressive symptoms 19(35.8%). This age group also suffered from highest percentage of mild to moderate depression 26(37.1%). However, Chi-square test could not find any significant relationship of depression level with age (p>0.05) (Table 5).

Depression and physical illness

Most of the respondents (85.1%) had no comorbidity like diabetes and hypertension. On the other hand, (14.9%) respondents had comorbid condition. But this finding was not statistically significant (p>0.05) (Table 6).

Discussion

Most of the respondents used shallow tube well water for drinking purpose (94%). This high percentage of use of shallow tube well was due to the location of study place which was an arsenic endemic area. Eighty percent of the respondents consumed arsenic contaminated water for more than six months and the rest 20% were both never user and less than six months. Why most of our study population still consume arsenic contaminated water where Government of Bangladesh install deep tube well for safe drinking water and painted red (3.5 million) for arsenic contaminated shallow tube well and green for deep tube well for non-contaminated tube wells to aware drinking safe tube wells water [13,14]. It might be the cause of most of the tube wells were installed privately [15]. So, poor people were not allowing to use these. Distance might be another cause of drink arsenic contaminated water. Previous shallow well is still in place. Moreover, installation shallow tube well was easy to draw up water by a hand pump drilling small diameter of pipe into. Therefore, families had no alternative but to drink from the contaminated well pire into the ground. [16].

Education

Percentage of depression score was found higher in low education group. Severe depression was higher among primary education group and mild to moderate depressive symptoms were more among illiterate respondents. But many studies showed that education can directly affect heath outcome by making process of information and health conscious [17,18]. Due to superstitions and prejudices of disease 30 to 80% people thought of arsenicosis as devil or impure air or a curse of God. All are them were uneducated and did not receive any treatment [19].

Gender

In our study more than 50% of the respondents were housewives. Work of house wife is non-paid occupation in our society, usually they were remaining at house doing house hold work and male counterpart went to work. Female had plenty of time to interview. This might be the cause of maximum female respondent of our study. Miyako et al. reported that there were the relationships between of unemployment and depression [20]. Moreover, female arcinocosis patients usually faced enormous social problems and social instability as well as marriage related problems [19]. However, in our study, we found that more than 70% of the housewives were suffered from all sorts of depressive symtoms which are consistent with previous report. In our study, females were suffered significantly more from depressive symptoms than males. Females were suffered more from both mild to moderate and severe form of depression than males (Table 4). Our study also revealed that moderate arsenicosis group 31 (44.3%) has suffered mild to moderate depression. Severe arsenicosis 11 (20.8%) had suffered severe form of depression. Before, 26.7% had mild arsenicosis had significantly no depression (Table 3).

Family status

In our society, most of the respondents had joint family. Female of joint family had higher depression score than nuclear family in the remote village. The people who were not drinking As contaminated water scared of arsenicosis, tend to avoid arsenic victims, barred from social activities, not allowed arsenicosis patients to attend social and religious programme, denied to take water from their deep tube well, not allowed to take baths in any of the village ponds/ river and students were debarred from school [10]. Social condition of married women of arsenicosis victim were grave, lead to a break-down of the marital relationships, some were separated or divorced or sent back to their parents' house [10,17]. Usually, people are not interested to make marital relationships with the families who were suffering from arsenicosis, that caused anxiety for both patients and parents of arsenic-affected area [17]. However, some studies conducted in arsenic affected areas reported that arsenic exposures are correlated with various neurologic problems [19]. In our study moderate arsenicosis group 31 (44.3%) has suffered mild to moderate depression. Severe arsenicosis 11(20.8%) had suffered severe form of depression. Though this deference were not statistically significant (Table 3).

Marital Status

In this study maximum respondents were married (81.0%). More than 70% severely depressed were married in arsenic patients in remote village in Bangladesh. Mild to moderate depression were also very much higher in married than not currently married. In our study shows that moderate arsenicosis group 31(44.3%) include in our study has suffered mild to moderate depression. Severe arsenicosis 11(20.8%) had suffered severe form of depression. A quarter had significantly no depression (Table 3).

Age

Our study could not detect statistically significant depressive symptoms in all age group. We found 48 years and above age group suffered from highest percentage of severe depression which is consistent with Valdes et al. They found that major depressive illness was associated with older age group [21]. Negative relation between age and depression was found U-shaped after adjusting for some sociodemographic factors [22].

Monthly income

Prevalent of arsenicosis patients were more among the poor [17] and had dietary deficiency [8]. They were remaining untreated due to financial constringent. Untreated poor victims are not capable of doing hard work and gradually lose strength. In Bangladesh lowest wage is BDTk 8000. In our space before in study, 40.5% had BDTk 5000-1000 income group and 32.7% were less them BTk 5000 and 26.8% more them BDTK 1000. In our study severe depression was found more among 5000 to1000 Tk monthly income group. Among the arsenicosis patient 40.8% had mild depression and severe depression patients were 35.0% followed by 24.2% had no depression.

Physical Illness

The different study showed association between depression with diabetes [23] or hypertension [24]. In our study, most of the respondents 143(85.1) had no space diabetes and hypertension. But respondents with physical illness suffered more from some sorts of depression than those without illness. But this finding was not statistically significant ($p>0.05$) (Table 6).

Arsenic and depression

Studies showed that that exposure to arsenic from drinking water was associated with reduced intellectual function [8,26]. Other study also found significantly association between arsenic-affected and poorer mental health [6,10]. A case-control study of Khan et al. in an arsenic-affected rural area in Bangladesh found significantly higher level of depression, weakness, restlessness, insufficient sleep, drowsiness and loss of appetite in case the group than [25]. They also reported include the after case that depressive feelings, fatigue and gastrointestinal symptoms which might be reflect of mental health problem in 61% of the cases group and around 44% of the controls group respectively [25].

Our study shows that moderate arsenicosis group 31(44.3%) has suffered mild to moderate depression. Severe arsenicosis 11(20.8%) had suffered severe form of depression. 26.7% had mild arsenicosis had significantly no depression. This deference was not statistically (Table 3).

Limitation

Our sample size was very small and was not representative of sample of the whole population. Depression was based on rather than a gold-standard diagnostic. Sampling technique was purposive to recruit the participant in the study due to time constraints. As a result, there might be some selection

bias. It may be evident to estimate the proportion of depression and factors associated with depression among arsenicosis patients.

Conclusion

Aim of this study was to assess the associated between extent of depression and different sociodemographic as well as illness factors in arsenicosis population. In our study moderate arsenicosis group 31 (44.3%) had suffered mild to moderate depression. Severe arsenicosis 11 (20.8%) had suffered severe form of depression. Though this deference were not statistically significant. Percentage of depression score was found higher in low education group. Severe depression was higher among primary education group and mild to moderate depressive symptoms were more among illiterate respondents. More than 70% of the housewives were suffered from all sorts of depressive symptoms in remote village of arsenic area. Gender had significant influence on proportion of level of depression. Females arsenic patients were more likely to suffer from both mild to moderate and severe depression than males. Age had no significant relation with depression. But respondents who were 48 years and above year's age group had highest percentages of severe depressive symptoms (35.8%). This age group also suffered from highest percentage of mild to moderate depression 37.1%. Family status, marrital status, income status had association with depressive symptoms. Most of the respondents had no diabetes and hypertension. But respondents with physical illness suffered more from some sorts of depression than those without illness. Arsenic exposed and patients with arsenicosis were found more likely to develop depressive symptoms.

Recommendation

During treatment planning process depression should be taken into an account in arsenicosis patients. Noncompliant arsenicosis patients should be routinely screened for depressive symptoms. Primary care physicians should be informed about the co morbidity of depression among arsenicosis patients.

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Conflict of interest

The authors declare no conflicts of interest.

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