Escalation of tuberculosis notification: an analysis of associated social factors

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Abstract. Studies have revealed that socioeconomic factors such as those pertaining to unmarried respondents, dependency, housing congestion and room sharing are associated with tuberculosis rates not only in developing countries but also in developed countries. Karachi has been identified as one of the most vulnerable cities where the spread of TB is increasing with the passage of time. The purpose of the present study is to assess TB notification with reference to some social factors in order that the findings of this study may provide helpful information for guidance related to social and economic policy formulation, at least at the local level to combat and eliminate tuberculosis. The methodology was based on NTP registered patients' data and social factor analysis data which were acquired through questionnaire survey from notified patients. The result pertaining to TB notification reveals an increasing trend during the last seven years from 2007 until 2013. The notification of female patients compared to that of males is high, which is evidence of the fact that women in Pakistan are more affected but a comparison of patients to the total population in the respective years i.e. the patient population ratio, reveals a decreasing trend. The findings of the study emphasize that the problem of TB control can be resolved expeditiously with the cooperation of the public sector, which should be motivated to meet the core requirements of the programme at various administrative levels and strongly enforced standards of quality of life.

Contents:

1. Introduction

Overcrowding and housing congestion are crucial sources of ecological deterioration and causes of infection hazards, among which tuberculosis is most famous for its spread and proliferation among the human masses. Karachi has been identified as one of the most vulnerable cities where the spread of TB is increasing with the passage of time. With reference to the global scenario, various studies regarding TB have described the TB situation in Pakistan as quite serious (Miandad et al., 2014; WHO, 2013; Metzger et al., 2010 and Hasan et al., 2010).

The National TB control programme (NTP) has launched fully equipped TB diagnosis centres with the help of the WHO throughout Pakistan. According to the NTP (2012) the number of patients in Pakistan has increased and it has secured 5th position amongst high burden countries and 4th among MDR (multi-drug resistant) high burden countries in the world. Estimated prevalence for all types of cases was 350/100,000. The impact of TB on socioeconomic status is substantial as about 75% of TB cases fall in the productive age group, i.e. 15–45.

Various studies have revealed that socioeconomic factors such as those pertaining to unmarried respondents, dependency, housing congestion and room sharing are associated with tuberculosis rates not only in developing countries (Enagi, 2011; Gupta et al., 2004; Souza et al., 2000) but also in developed countries due to immigrants who came from countries where tuberculosis was common (Zammarchi et al., 2014; Ploubidis et al., 2012; Rodwell

et al., 2012; Clark et al., 2002; Tomás et al., 2013). In view of this situation, it is necessary to assess the relative importance of various factors, which may be interrelated, in order to understand the current epidemiology of the disease. With this purpose in mind three social factors were set as indicators for analysis of TB patients in the study area. The development and employment of indicators is a method whereby comprehension of relevant information is highly facilitated (Auclair and Guenter, 2002; Terwin, 2001). Relevant indicators allow policy makers to anticipate future trends, measure the impact of policies, identify priority issues and problems, and allow for comparison of places and situations at one point in time and across time (Huda et al., 2013a; Cobb and Rixford, 1998).

The study of housing congestion is of significance in the evaluation of environment in relation to the spread of infections because varying degrees of congestion are a reflection of the manifestation of poverty and environment conducive to the spread of infection at different levels. Some studies have indicated that the air quality of a residential home varies in relation to outdoor air quality (Kolappan, and Subramani, 2009; Cohen, and Mehta, 2007). Many studies have found that the concentrations of suspended particulate matter were higher indoors than outdoors, when there were sources of indoor particulate pollution in domestic homes (Perez-Padilla et al., 2005; Mehta et al., 2013; Ezzati and Kammen, 2001; Woodruff et al., 2006). Incremental concentrations of fine particles were attributed to tobacco smoking and operation of gas stoves for cooking. Studies indicate that indoor air quality directly affected health, thus a high

rate of room congestion is not favourable for human health (Jassal et al., 2013; Altet-Gomez et al., 2005 and Lin et al., 2007).

Congestion is also a reflection of the effect of the economy on social conditions, and it may be partly due to the inability to pay high rents. However, the phenomenon of crowding, though many may view it as physical and social density, does necessarily incorporate a geographical dimension. It takes into account various effects such as the 'physical effect' or the 'household effect', size of family and characteristics of members of the society in the broader framework of living space and consumption (Clark et al., 2000). The phenomenon of social crowding is related to the perception of the environment by an individual or a group or a section of society, and is largely the subjective feeling and assessment of the environment by the person concerned. Excessive crowding has been found to have a deteriorative impact not only on conditions of health and education but also largely on distortion of social and psychological values.

In Muslim countries like Pakistan, the institution of marriage is of vital social significance as it is the only legal means of family formation in Islamic society. Therefore, marriage is a very clear indicator of the culture of a society. In view of this fact, the consideration of a never married population as a social factor is important under our conditions as it is only under very peculiar circumstances that people especially boys do not get married and it becomes a matter of grave social concern. Exclusion of girls from marital bondage, however, reflects serious medical causes, because it is only under exceptional cases that even special girls do not get married, as nuptial rites are executed at a very tender age in the rural societies of Pakistan.

Another social factor, the dependency ratio has been included to show the spread of TB among different age groups, because culturally the population from 0–14 years of age and most housewives and persons aged 60 and above have been noted to be the responsibility of the population in the working age group in Pakistan (Huda et al., 2011). It is expected that the findings of this study may provide helpful information for guidance related to social and economic policy formulation at least at the local level in the battle to fight and eliminate tuberculosis.

2. Materials and method

2.1. Study area

Karachi is the capital city of the province of Sindh, and the largest and most thickly populated (16 million) city in Pakistan. Located strategically between 24.750 to 25.656 N and 66.653 to 67.574 E on the coast of the Arabian Sea, north-west of the Indus River delta, it covers an area of 3,600 km² (Huda et al., 2013b).

2.2. Data collection and analysis

Tuberculosis notification data were obtained from the Provincial TB Control Programme (PTBCP) Karachi, Sindh at Basic Medical Units level from 2007 to 2013, while population data were acquired from the Population Census Organization, Govt. of Pakistan. Therefore, for the study of TB patients' associated social factors designated diagnostic centres from PTBCP were selected in pursuance of standard techniques in which the primary data source was a questionnaire survey. A Likert scale format was designed and used to elicit individual patient's responses. Subsequent to significant discussions with experts six major questions were selected. The score range on each question depends on categories of answers, so the total for the six questions outcomes was 20 (Table 1). Data were collected through face to face interviewing of patients at TB diagnostic centres in the study area. The average prevalence of patients (p) at a confidence level 95%, confidence interval (CI) of 4 (alpha=0.05) and a deviation (d) of 0.02 was 20%. Acceptable sample size was thus determined to be 600 as per the last population census of the present study's selected area (This only contains those Union Councils (UCs) where TB notification was reported during the field survey). The questionnaire survey was conducted over a period of eight months (March to October 2013). Figure 1 depicts respondents' locations in the study area among the population of UCs. Data were entered into a Microsoft Excel spreadsheet and analysed with Microsoft Excel and SPSS Version 20 for analysis of the Age and Sex Pyramid. In addition, demographic analysis provided significant knowledge of various aspects of disease epidemiology and patients escalation where in social factor evaluation is deemed essential.

Table 1. Geo-demographic distribution of notified tuberculosis respondents

Sr. No	Variables	Male	Female	Total	Age Groups					
		n = 304	n =2 96	600	11–20	21–30	31–40	41–50	51–60	61 +
1	**TB Types**									
	PTB	272	240	512	121	162	63	66	46	54
	EPTB	32	56	88	32	25	10	14	6	1
2	**Marital Status**									
	Married	184	188	372	19	111	63	77	52	50
	Unmarried	115	109	224	134	76	10	2	0	2
	Widower/Widow	0	4	4	0	0	0	1	0	3
3	**Dependents**									
	Yes	53	273	326	111	93	28	37	22	35
	No	246	28	274	42	94	45	43	30	20
4	**Accommodation Sharing**									
	Yes	291	294	585	151	179	70	80	51	54
	No	8	7	15	2	8	3	0	1	1
5	**Family Status**									
	Nuclear Families	98	97	195	43	64	26	34	15	13
	Joint Families	201	204	405	110	123	47	46	37	42
6	**Employment Categories**									
	Skilled labor	25	3	28	6	11	6	1	2	2
	Textile	31	2	33	6	13	7	5	1	1
	Other factories	5	1	6	1	3	1	0	1	0
	Private Job	60	8	68	8	12	11	13	12	12
	Agriculture	5	0	5	1	0	2	0	2	0
	Self Employed	15	0	15	0	7	2	1	0	1
	Driver	19	0	19	3	8	3	4	0	1
	Govt. Jobs	8	2	10	1	3	0	4	2	0
	Laborer	80	10	90	12	22	14	14	18	10

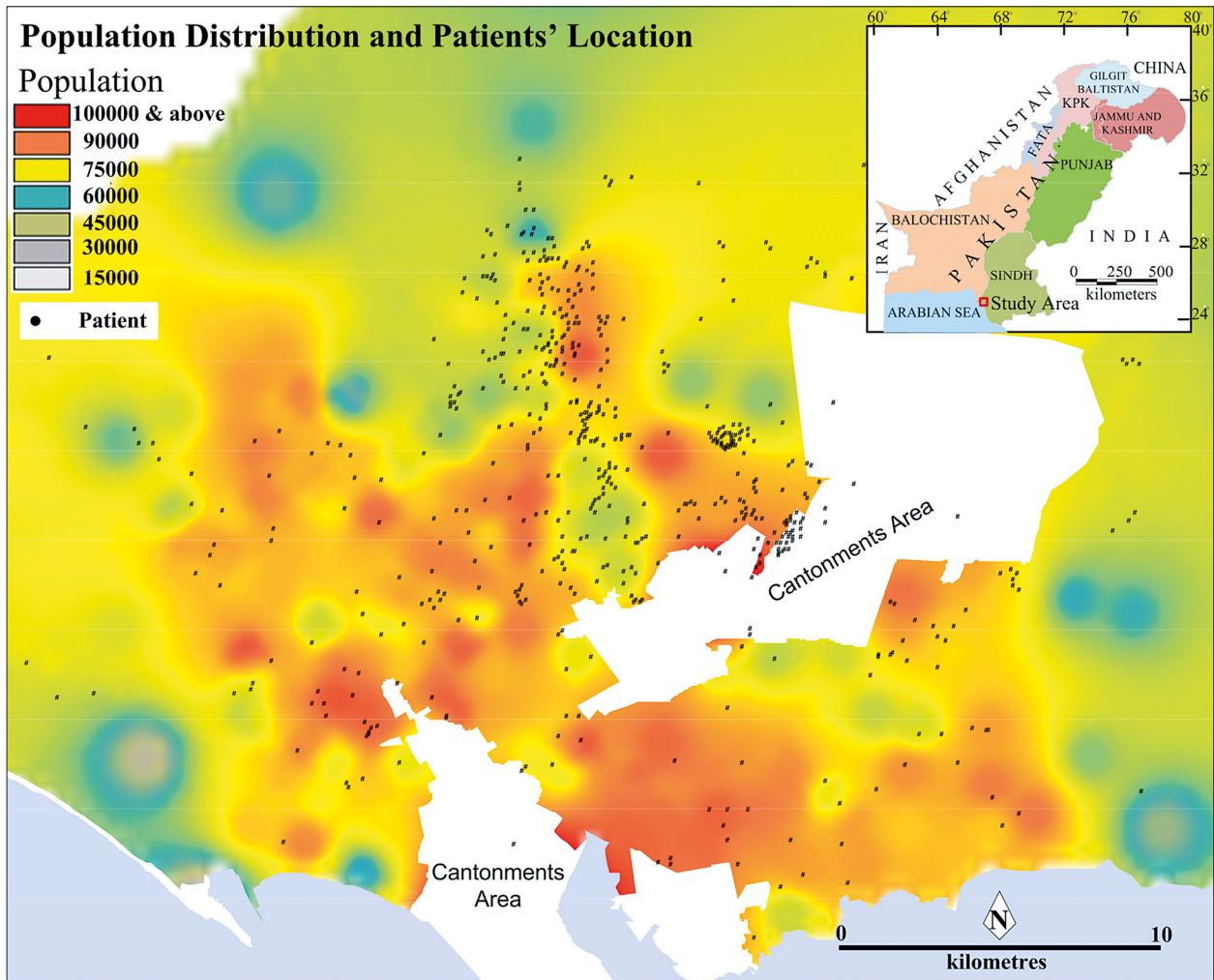*Source:* Authors' own work, based on questionnaire data

Fig. 1. Study Area Population at Union Council level and Locations of TB Respondents

Source: Authors' own work, based on data from Population Census Organization, Govt. of Pakistan and questionnaire survey 2013

3. Result and discussion

3.1. Analysis of TB incidence

Data pertaining to seven years from 2007 until 2013 revealed TB notification in the study area. Except for 2009, an increasing trend was observed for male, female and total patients, as revealed in Fig. 2. The notification of female patients compared to that of males is high, which is evidence of the fact that women in Pakistan are more affected by mycobacterium (Shah et al., 2014). The rate of increase was recorded as 5.27% between 2007–08, which however showed a negative trend with a -20% decrease between 2008–09, followed by the highest increase in notification i.e. 33% between 2009–10 with ref-

erence to all the years under study. 2010–11 also recorded a 15.72% rate of increase while during 2011–12 the notification dropped by -3.88%, but in the next year i.e. 2012–13 it once again revealed an increasing trend at the rate of 7.82%.

The study reveals that during the whole study period except for 2010–11 male patients dominated comparatively over females at rates of 0.38%, -5.90%, 1.45%, -1.10% and 1.44% for 2007–08, 2008–09, 2009–10, 2011–12 and 2012–13, respectively, irrespective of whether they were negative or positive trends. In contrast, in 2010–11 females dominated by 2%. Although, the notifications of TB have recorded an increasing trend with the passage of time in the study area, a comparison of patients to the total population (in the study area) in the re-

spective years. In 2007, the population patient ratio was 1:509, which improved in 2009, while from 2010–2013 the average ratio was 1:415 i.e. a deteriorating scenario (Table 2).
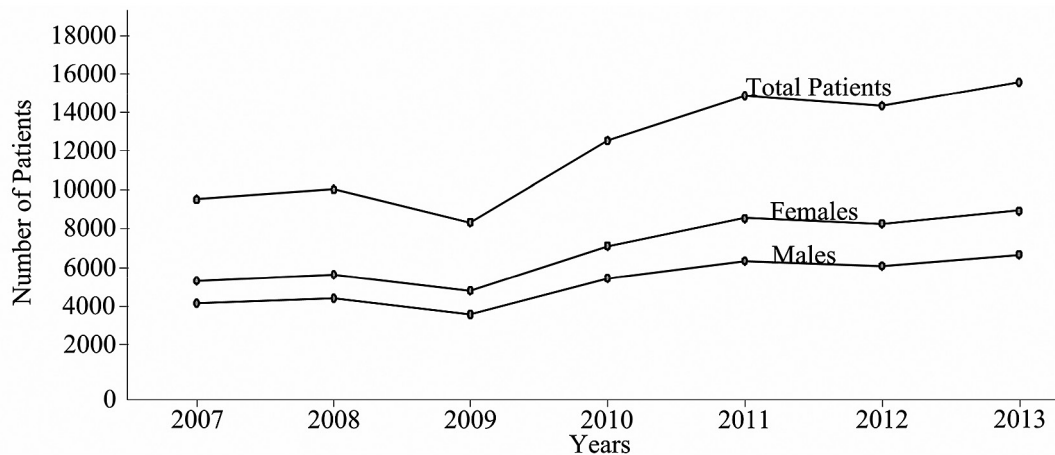

Fig. 2. TB Patients in Karachi

Source: Authors' own work, based on data from Provincial TB Control Programme (PTBCP) Karachi, Sindh

Table 2. Proportion of Patients to Population

Years	No. of Patients	Population (million)	Pop./ /Patients
2007	9,515	4.84	509
2008	10,045	5.03	501
2009	8,377	5.28	630
2010	12,543	5.55	443
2011	14,883	5.81	390
2012	14,368	6.09	424
2013	15,587	6.33	406

Source: Authors' own work, based on data from Population Census Organization, Govt. of Pakistan and Provincial TB Control Programme Karachi, Sindh

Results from the questionnaire survey are shown in Table 1. Pulmonary tuberculosis was highly reported (85.33%) among both males and females while in terms of age groups those highly affected (55.30%) were revealed as the 11–20 and 21–30 age groups. With reference to the social factor married people (62%) were comparatively more affected than their unmarried counterparts (37.33%). The variable of dependents is a significant component of socioeconomic indicators, which portrays the impact of poverty, as increasing numbers of dependents is a socio-economic burden on stand-ards of living. The dependency was reported around 54.33%. The high percentage of patients who replied in the affirmative with reference to accommodation sharing (97.50%) indicated a high level of poverty. They were aware of their vulnerability to TB, but being financially unable to afford isolated rooms they were highly exposed to Mycobacterium contagion 67.50% of patients reported that they lived in joint families which was also a major cause of accommodation sharing. Table 1 also reveals that some formal sectors such as the textile industry is a significant TB producer in the study area, which a reflection of the ignorance regarding health safety rules which were imposed by the government under environmental laws. Males have emerged as the major victims of Mycobacterium in the employment category, especially male labourers.

3.2. Demographic analysis of patients and their associated social factors

The proportion of TB patients (respondents) in different age groups in terms of sex-ratio is shown in Fig. 3, which reveals that the percentage of female respondents was marginally greater than that of males, i.e., 50.17% to 49.83%. The salient feature

of the pyramid is that the percentage of female respondents in the age group 11–20 was the highest (33%) while that of males was the highest in the age group 21–30 (35%). The lowest recorded occurrence both among males and females was in the age bracket 51–60 (11% and 6.3% respectively).The reason for these age-sex differences may be attributed to the fact that not much attention is paid to the diet and health of girls in third world countries, while young boys in the age group 21–30 live under the tension of unemployment and acquiring jobs, thereby becoming addicted to various harmful varieties of smoking etc. (Chiang et al., 2007), which coupled with poor diet multiply the chances of contracting TB.

The proportion of unmarried males to total male respondents is estimated as 36.45% and unmarried females to total female respondents as 38.46%, while the percentage of unmarried to total respondents is 37.33%, according to questionnaire survey. Figure 4, depicting the percentage of unmarried TB patients (respondents) in different age groups reveals that the proportion of male respondents was higher (51.34%) in comparison to that of females (48.66%) and the number of female unmarried respondents out of total unmarried females was highest in the age group 11–20 (77%) while that of males was in the age group 21–30 (47%). 1.7% of males were found as never married while no unmarried female was found in the age group 41 and above.

Young unmarried girls in addition to being undernourished are under the constant tension of not being married and its associated problems as a result of which they suffer from deficiency of immunity and thereby contract diseases, especially a contagious disease like TB. Young unmarried males in the age group 21–30 in addition to problems of unemployment and lack of care due to being bachelors coupled with carelessness in diet create conditions highly conducive to the contraction of TB. This is an indication of poor socioeconomic conditions prevalent with reference to spinsters and bachelors in third world countries. According to the Population Census Organization (1998) those persons are non-workers who have not been engaged in any occupation for even one day in the week of census enumeration and are considered as dependents (GoP, 2000).

Figure 5, depicting the dependent TB patients by age and sex reveals that the female dependents amounted to 74.27% while male dependent respondents were only 25.7%. The highest percentage of dependents among females was recorded in the age group 21–30 (77%), while among male patients it is (27%) in the 60+ age group. In third world countries, of which Pakistan is a part, dependency in the family system is not unusual, especially among women, children and aged members of families, as this is engrained in the traditional roots and social values of such societies (Ali et al., 2011; Zaman et al., 2006). According to the NIPS report (2008), more than 50% of women lack basic education and around 20–30% earn some income, but most women in Pakistan are confined to their homes to accomplish household chores for their extended families, as such being excluded from main decision making and improvement in their quality of life (Rabbani et al., 2008).

In Pakistan, joint family systems include grandparents, uncles, aunts and cousins, who share available resources i.e. money, food and all requirements. Being determined by tradition badly affects the genuine and special needs of some members of the family. Figure 6, showing the conditions of sharing accommodation by patients, reveals that 49.74% male respondents share a residence while females constitute 50.26%. Female patients in the age group 11–20 and males in the age group 21–30 constitute the highest percentages, i.e. 34%. This is quite similar to the conditions of unmarried patients. Unmarried girls share rooms and live closely huddled, while males in the age group 21–30, who constitute the initial working class have to share their accommodation with male counterparts due to poor fiscal conditions, thus creating negative social as well as ecological conditions leading to the proliferation of an infectious disease like TB. 97.05% of patients to total respondents revealed that they shared their accommodation.

Comparative analysis regarding patients living in separate and combined family systems has provided evidence regarding high household density as being one of the major causes of the spread of infectious diseases among which TB is the most common.
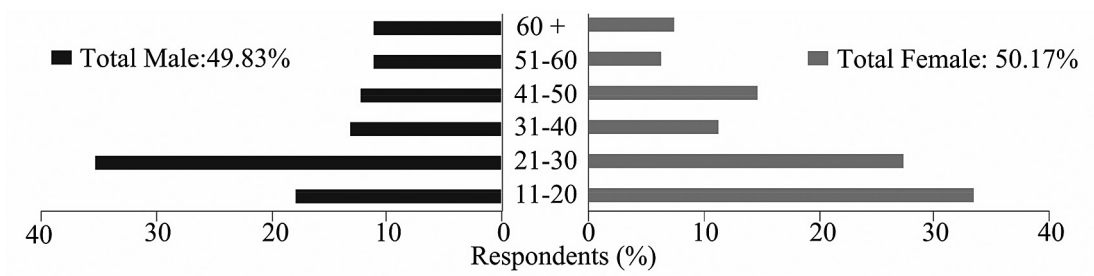
Fig. 3. Gender Variation of TB Patients by Age and Sex
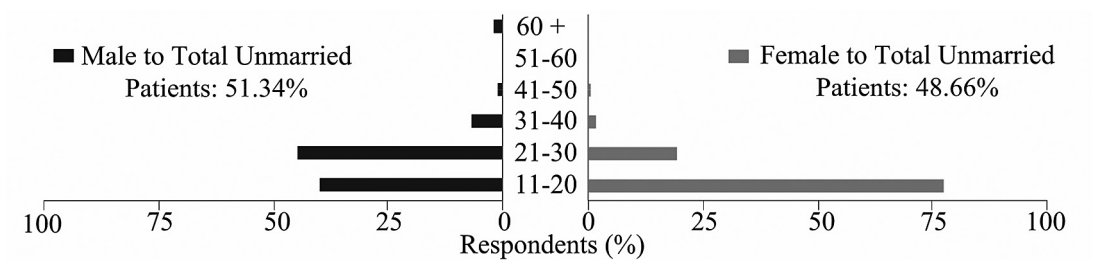
Source: Authors' own work based on questionnaire data

Fig. 4. Unmarried Patients by Age and Sex
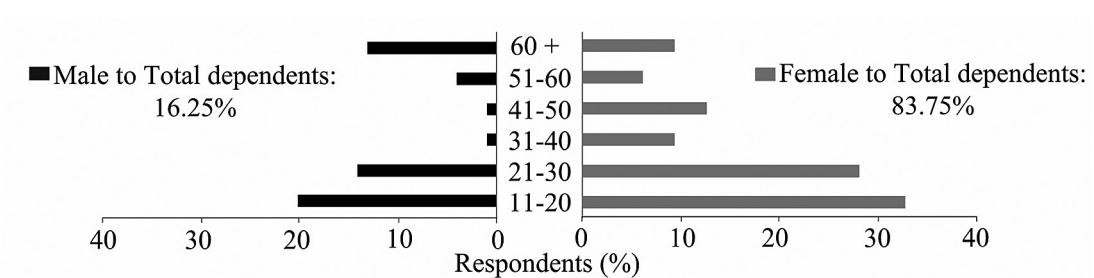
Source: Authors' own work based on questionnaire data

Fig.5. Dependent Patients – Distribution by Age and Sex

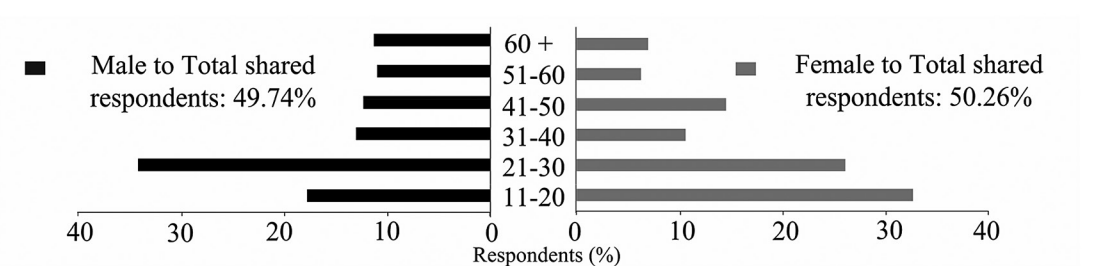*Source:* Authors' own work based on questionnaire data

Fig. 6. Patients who shared their accommodation – Distribution by Age and Sex

Source: Authors' own work based on questionnaire data

4. Conclusions

TB control programmes have a significant role with reference to mycobacterium elimination but it is necessary to highlight and discuss the most favourable associated social factors which provide the favourable environments for growth and proliferation of mycobacterium. The present study has highlighted some vulnerable sectors among which schools and textile factories are prominent. The government will introduce a TB test for students on an annual basis especially in those areas where significant TB notifications have been observed. The government has also initiated serious actions against those industrial sectors where health and safety rules were not implemented in industrial organizations because in the present study significant numbers were reported. It is necessary for administrative authorities to organize vigilance teams for monitoring health and safety precautions which were notified by the industrial administration under the environmental law and randomly conduct a TB test among textile workers and other TB threatened mills and factories. During the questionnaire survey some respondents informed that more women workers especially the unmarried hide TB symptoms from others because of the fear of social as realism and married problems. The National Tuberculosis programme ensures emergency work of identifying of all new cases, while simultaneously making progress against the most serious existing cases. The problem of TB control can be resolved expeditiously with the cooperation of the public sector which should be motivated to meet the core requirements of the programme at various administrative levels. Efforts must be directed towards translating the high level commitments of the programme into concrete terms thus putting the aspirations of the TB control mechanism on an even keel for the betterment of the population of Karachi, thereby ensuring healthier quality of life and improved standards of living.

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