

## Food knowledge and preferences of pulmonary tuberculosis patients at Saudi Arabia "A case study"

AL-Zahrani Maria, T.<sup>1</sup> and AL-Osaimi Hind, S.<sup>2</sup>

<sup>1</sup>Food Science and Nutrition, Umm Al-Qura University, KSA

<sup>2</sup>Ministry of Education, El-Taif Governorate, KSA

[Mostafa790@gmail.com](mailto:Mostafa790@gmail.com)

**Abstract:** The aim of the current study is to identify the food awareness and preferences of Saudi and non Saudi's patients suffering from pulmonary tuberculosis (TB) at Chest Hospital, Taif, Kingdom Saudi Arabia. The current study showed that the Saudi's patient ages were statistically significantly varied and ranged between 14 and 81 years old with an average of 37.12 years (SD ± 10.03), whereas the non-Saudi patient ages were lowered (between 14 and 50 years with an average of 27.88 (SD ± 10.03) years). It could be also found that the education level as well as the nutrition and healthy knowledge were higher among Saudi's patients than that compared with the non- Saudi's patients. Poor eating habits, such as the intake was consisted of only one or two meals, the low intake of high antioxidant foods and vitamins (i.e., fruit and vegetables) and the high intake of high energy foods and soft drinks, were detected among patients, especially in case of non Saudi's patients. It could also be observed that there were highly statistically significant differences among the Saudi and non Saudi's patients in the preferences of some specific foods and their consumption amounts. In general detailed studies, related to nutrition and health education, especially in case of chronic disease ' patinas and how to deal with such status, as well as the nutrients and antioxidants resources and their utilization in nutrition and therapeutic roles, are necessary.

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### 1. Introduction

The Healthy report of the Ministry of Health, KSA in 1430 H confirmed that the prevalence of tuberculosis among the population of Saudi Arabia recently increased and the total number of pulmonary tuberculosis and pneumonia cases in Saudi Arabia reached 3949. It was also reported that the infection rate in 2009 became 15.59 case/100,000 inhabitants of population. Of such cases, the proportion of Saudi's patients amounted 51.5% versus 48.5% of non- Saudi's patients. This increment may be due to the continuous improvement of recording and reporting the patient cases, and also due to the ongoing education of the community at different occasions (Health Statistical Year book, 2009). Despite the welfare living and abundance of toll-free medical insurance in Saudi Arabia, the recent studies showed a high incidence level in urban areas (10%) and a low one in the rural areas (2%). It was due to that these areas receive annually more than million pilgrims, in addition to the escape of some population from carry out the TB test which has to apply to people from some countries suffering from the disease such as Yemen and Somalia, in addition to the foreign workers, labor from abroad, particularly domestic workers, drivers and pilgrims coming from infected areas (Bener, 1990; Al-Kassimi *et al.*, 1993; Milaat *et al.*, 1994; Al-Hajoj

*et al.*, 2007). The previous studies and reports also pointed out that the risk of TB is affected by the nutritional status (NICUS, 2008; Cegielski, and Mc Murray, 2004; Paton *et al.*, 2004; Hanekom *et al.*, 1999) and dietary behavior of each individual at the population society (Van Dillen *et al.*, 2008) and also the nutritional and healthy awareness. The studies of Khan *et al.*, (2006) and Singh *et al.*, (2002) revealed that the lack of knowledge about tuberculosis could be considered as an alarming tool and there is a critical need for more health education programs and overcome their misconceptions. It was also found by the studies of both Baldwin *et al.*, (2004) and lönnroth *et al.*, (2010) showed that TB patients possessed a lower level awareness toward their diets and its impacts on health. The study of Legesse *et al.*, (2010), also, added that there are some misconceptions health behaviors among patients and 87.6% of such patients are sharing in utilization the common cups.

The incidence of tuberculosis affected in changing a lot of food habits, especially the wrong of them; The study of Vumiria (2008) showed that there were wrong dietary habits between patient whom were curing in the hospitals such as: irregularly meals eating; specially the dinner where the patient delete such meal and wait for the next day to get the breakfast meal and the other deals with only two meals a day. According to the Tungdim and Kapoor (2008) study, there is a reduction in energy consumption among people with TB. It was because of eating lower food amount and poor eating habits or loss

of appetite. Gupta *et al.*, (2009) reported that providing the dietary advices to increase the amount of energy with the provision of food supplements, resulted in a significant increase in body weight gain, weight mass, fat and also improve the immunity after 6 weeks of treatment, and such improvement could facilitate in returning to productive activities.

There is a scarcity of conducted studies involved in identification of the awareness and custom and dietary behavior and also the impacts of the residence on the improvement of weight and body mass for pulmonary tuberculosis' patients in relative to the non-Saudian patients at the hospital of the Kingdom of Saudi Arabia. Therefore the backbone of the research objective is to identify the awareness and preference of food items for patients with pulmonary tuberculosis Saudi and non Saudi at Chest Diseases Hospital inpatients at Taif, Saudi Arabia.

## 2. Materials and Methods

### Research sample

The internal Saudi and non Saudi patients at all departments of the Chest Diseases Hospital during the period of 1429-1430 AH, reached 373 patients. Of them, the number of Saudi admissions was 244 patients (65.41%), while non-Saudi patients reached to 129 patients (34.59%). 128 patients of them only were shared as a representative sample of patients (34%). It was due to the forbidden of allowance to the author to enter the men's section, according to the regulations the hospital, and the rest of the sample refused to participate in the study. The study sample was divided into two groups: the first group was Saudi patients and it was represented a 66.4% ratio of the total sample, while the second group was the non-Saudi patients and it was represented a 33.6% ratio of the total sample. The descriptive and analytical approach was used due to its suitability to the nature of the study (comparative approach).

### Research Tools

#### The Socioeconomically data:

Such as age, place of birth, sex, nationality, educational status of the research sample (divided into three levels (high, medium, and low) and the monthly income of the family, were gathered by a previously prepared questionnaire.

#### The awareness and eating habits:

It was divided into the following items:

##### a- Health knowledge:

It included 41 questions, in order to measure the health knowledge. The question must be answered by one of the given three options. The three answers were yes, no and I do not know. The

correct answer was given two degrees, the wrong answer was given zero and in case of no answer, reflecting no knowledge case, the recorded degree was one. The lowest degree recorded zero and the highest one recorded 82 degrees. The total score of the questions was summed and it was represented the health awareness degree. According to the total score the health awareness degree could be classified into the following four groups.

- The health awareness is very low when the health awareness degree was less than 55%,
- The health awareness is low when the health awareness degree was in the range of 55-70%,
- The health awareness is medium when the health awareness degree was in the range of 70-85 %, and
- The health awareness is high when the health awareness degree was higher than 85%.

##### b- Nutrition Knowledge:

It included 42 questions related to the nutrition information. The answers and the score system were as the same in case of health knowledge. The total score, represented the nutritional and the healthy awareness degree, could be classified, into the four groups as previously mentioned in case of health knowledge.

##### c- Custom and nutrition habits:

It included a number of questions relating to information concerning the custom and nutrition habits. Its response was always, sometimes and not.

##### d- Food preference:

It is very useful to identify the dietary behavior of individuals and used to collect the information about the individual consumed food items. Food preference groups and nutrition history were classified according the major food groups, i.e., meat and their analogue group; milk and milk product groups; bread and cereal groups; fruits and vegetable groups and numerous food group.

##### Scale and ruler metric:

It was used to measure the height and weight and then calculate body mass index to identify the improvement level in weight and consequently the nutritional status of patients. The individual height was measured without shoes, where a person stands in an upright position with the paste heels against the wall and take the sign of the scale over the top of the head; then recorded the reading to the nearest 0.5 cm. The weight was measured while the person was wearing light clothing and without shoes by the nursing staff interior departments and recorded in the medical records.

BMI is an indicator to measure the prevalence of malnutrition of the research sample according to the classification of Zachariah *et al.*, (2002) and Garrow (1989). It was calculated according the following equation:

$$\text{Body mass index (BMI)} = (\text{weight in kg}) / (\text{height}^2 \text{ in m}^2)$$

Reliability and validity of questionnaire

##### (1) Accuracy of judgment:

The initial questionnaire was firstly presented to some of the faculty staff whom were specialized in nutrition and food sciences, a staff of chest diseases hospital in Taif and a staff of Research Center, King Faisal Specialist Hospital, Riyadh. It was to give their opinions about the questionnaire questions and themes of resolution and the clarity and coherence and suitability for use and achieve the objectives of the study. Most of the arbitrators showed their approval on the majority of the phrases, with some modifications on some statements which were restructured to make the questionnaire more subjected to the reliable and valid of the content.

### (2) The stability of the questionnaire:

Cronbach Alpha test was used to measure the stability of the questionnaire. It recorded 0.78 for the stability degree of custom and nutrition habits. Such value seemed to be a slightly fairly constant average and the custom and nutrition habits questionnaire recorded a highly stability values (0.95 and 0.93, respectively).

### Statistical analysis:

The obtaining data from the field study was statistically analysed using the statistical data descriptive statistical SPSS program package in order to calculate the mean, standard deviation, frequencies, percentages and chi square test and  $t$  -

test, correlation coefficient and Pearson and Cronbach alpha. The differences could be statistically significant considered at the 0.05 and 0.001 level.

### 3. Results

#### The socioeconomically data:

##### a. Age:

Data presented in Table (1) showed that the age of Saudi patients was ranged between 14-81 years with an average of  $37.12 \pm 10.03$  years. The age of non-Saudi patients was, on contrary, lower and ranged between 14-50 years, with an average of  $27.88 \pm 10.03$  years and the differences was statistically significant (the values of  $t = 3.32$  at moral level of  $= 0.001$ ). The same Table showed, also, that the majority of Saudi patients (64.7%) and non-Saudi (76.8%) patients were not exceeded the 50 years old, meaning most of the patients were within the working and production age did of age.

##### b- Sex:

Table (1) showed that the proportion of non-Saudi female patients was high (62.8%) compared to that of Saudi patients (58.8%). It was also noted that the of Saudi male patients proportion was higher (41.2%) than the non-Saudi patients (37.2%).

Upon inquiry on the nationalities, of the pulmonary (TB) patients, the results (non tabulated) showed that 62.8% of the patients were from Africa, 32.5% were from India and the rest of the of the individual study (4.7%) was from South-East of Asia.

**Table (1): Age and sex distribution of the Saudi and non Saudi patients**

Age distribution in				
Age	Saudi		Non Saudi	
	*f	%	*f	%
>20 year	10.0	11.8	10.0	23.2
20-<50	54.0	64.7	33.0	76.8
> 50	20.0	23.5	0.0	0.0
total	85.0	100	43.0	100
MEAN±SD**	37.12±16.25		28.02±10.03	
Sex distribution (%) in				
Sex	Saudi%		Non Saudi	
Male	41.20		37.20	
Female	58.80		62.80	

\* Frequency      \*\* statistically significant at 0.01

##### c – Education status:

The education status of pulmonary TB patients in the current study is showed in Table (2). It could be noticed that there were a detect Table decrement in the incidence of such disease among those with a higher education level. The incidence of the disease in the highest education level was 9.41 and 7% among Saudi patients and patients of non-Saudi, respectively. On the other hand, the pulmonary TB incidence was statistically significantly higher, in case of individual with medium and low education levels.

##### d - Family's monthly income:

Table (2) shows the relation between pulmonary TB incidence and monthly income of the family It was showed that a high proportion tuberculosis incidence in Saudi and non Saudi (54.1 and 86.1%, respectively) was detected in case of low income (<2500 LB). An opposite trend was detected in case of the highest family income (>10000 LB), wherein, pulmonary TB incidence in Saudi and non Saudi was 2.4 and 0.0%, respectively).

**Table (2): The educational status and family's monthly income of the Saudi and non-Saudi patients**

Education	Saudi		Non Saudi	
	*f	%	*f	%
Low	38	44.71	17	39.50
Medium	39	45.88	23	53.50
High	8	9.41	3	7.00
Total	85	100	43	100
Family's Monthly income (in LB)				
Very low (< 2500)	46	54.10	37	86.10
Low (2500>5000)	25	29.40	5	11.60
Medium (5000-10000)	12	14.10	1	2.30
High (> 10000)	2	2.40	0	0.00
Total	85	100	43	100

\* Frequency

**The awareness and eating habits:****a. Health knowledge:**

The healthy awareness concept is intended to supply the popular some of the healthy information, facts and their sense responsibilities towards their own and other health. The health awareness possessed, also, an important role in the prevention of disease and reduce the setback and the frequency of hospital residences and maintain the health of individuals and their families. Data presented in Table (3) show that there was a high significant difference among patients of non-Saudi compared to patients Saudi, in case of the health knowledge. It was also noted that the average level of knowledge as the average degrees of health literacy recorded 63.60 (SD  $\pm$  10.07) degrees for Saudi patients while it was increased to 66.90 (SD  $\pm$  10.41) degrees among patients of non-Saudi. It was found that more than half of the sample of non-Saudi patients (51.2%) possessed a high health awareness. Such value was lower (34.1%) in case of the Saudi patients. While health knowledge of the Saudi patients was increased among middle, low and very low levels compared to non-Saudi patients.

**b. Nutritional knowledge of knowledge of food:**

Table (3) There was a non significant difference in the nutritional knowledge of food among the patients of non-Saudi compared to patients Saudi, since the average degree of nutritional knowledge at the Saudi patients recorded 51.97 (SD $\pm$  9.71) degrees, and increased in non-Saudi patients to 53.05 (SD $\pm$  7.85) degrees. It declined to be 44.7% in case the Saudi patients and to be 32.6% in case the non-Saudi patients.

**c. Health and food habit****1- Health practices of hygiene practices:**

The effect of awareness and health knowledge on health habit in Saudi and non-Saudi patients are shown in Table (3). The majority of

Saudi and non-Saudi patients possessed a health practices ranged from the level of medium and good without significant differences. Wherein, it was found that more than half of Saudi patients (51.8%) and non-Saudi (52.4%) gained the acceptable level of health practices, including medium.

On contrary, as noted from the study, not tabulated, about half of the sample of patients does not care about sterilize their personal instruments, and about 90% do not play sports, while 42% of patients did not exposed their bodies to sunlight a day.

**Table (3): Health and nutritional knowledge status and level of health practice of the Saudi and non-Saudi patients**

Health knowledge	Saudi		Non Saudi	
	*f	%	*f	%
High	29	34.1	22	51.2
Medium	36	42.4	14	32.6
Low	12	14.1	3	7.0
Very low	8	9.4	4	9.3
MEAN $\pm$ SD	63.60 $\pm$ 10.07		66.90 $\pm$ 10.41	
Nutritional knowledge				
High	3	3.5	9	20.9
Medium	18	21.2	20	46.5
Low	26	30.6	14	32.6
Very low	38	44.7	0.00	0.00
MEAN $\pm$ SD	51.97 $\pm$ 9.71		53.05 $\pm$ 7.85	
The level of health practices				
Good	32	37.6	15	35.7
Medium	44	51.8	22	52.4
Low	9	10.6	5.0	11.9
Very low	---	---	---	---

\* Frequency

**2- Feeding habit:**

The results showed that there are many bad dietary habits between the study patients, especially among Saudi than non-Saudi individuals, such as

intake only one or two meals a day, a low intake of rich antioxidants and vitamins (vegetables and fruits) foods and a high intake of soft drinks and rich energy foods. Detailed discussion on such practices is followed:

#### a -Number of meal intakes:

The number of meal intakes, in a day, which reflect the state of health and appetite of the Saudi and non-Saudi individual patients are mentioned in Table (4). Number of meals is affected by the healthy status and the lower appetite. As the appetite is lower, the meal intake is decreased. Wherein, the tuberculosis patients are usually suffering from the low appetite. It is clear from the Table (4) that 54.1% of the Saudi and 46.5% of non-Saudi patients eat three meals a day, while there was a significant variation in those take only one meal or two meals a day. As noted, also, there was a non significant increase in the intake of non Saudi for four meals a day compared to Saudi patients. It was inquired that the reasons for not eating meals could be attributed to a loss of appetite and lack of desire to eat. While the other reasons were varied between snacks intake or plenty drinking fluids before meals.

#### b - Feeding habit in case of meal rejection:

Table (4) showed some of the food practices for patients in the absence of desire to eat. It was found that 67.1% of Saudi patients, sometimes, force themselves to eat a meal. While such phenomena was raised among non-Saudi patients,

where it reached to 72.1%. It was, also, noted that a higher number with statistically significant differences ( $P < 0.05$ ) of non-Saudi patients (76.7%) sometimes interest to intake delivery meals than that of Saudi patients (63.5%).

#### c- Favorite cooking methods:

The cooking method affect on the sensory attributes of processed meal in terms of taste, flavor and odor. The cooking method affect, also, on the nutritional value of meal and increase the amount of food intake. Table (9) showed that the majority of patients reject to identify any specific cooking method. It was found that they ate food cooked by several methods and the cooking by the steam method was the least favorable method without any statistically significant differences.

#### d – Beverages and stimulants

Drinking natural beverages and stimulants such as tea provide patient by antioxidant compounds that improve the nutritional status and help speed healing. It was shown from Table (4) that beverages and stimulants were more consumed by Saudi patients than non-Saudi. Exactly 55.3% of the Saudi patients prefer to drink tea, while the percentage dropped to 32.6% in case of non-Saudi patients and the differences statistically significant values were  $P = 0.05$ . It was also noted that 35.3% of the Saudi patients prefer to get the soft drinks and the percentage dropped to 11.6% in case of the non-Saudi patients with a statistically significant difference values of  $P = 0.05$ .

**Table (4): The feeding habit of the Saudi and non-Saudi patients**

Number of meals	Saudi			Non Saudi		
	Yes	Sometimes	Not	Yes	Sometimes	Not
<b>One Meal</b>	8.2	3.5	88.3	9.3	2.3	88.4
<b>Two meals</b>	17.6	5.9	76.5	7.0	4.7	88.3
<b>Three meals</b>	54.2	12.9	32.9	46.5	9.3	44.2
<b>Four meals</b>	12.9	7.1	80	20.9	7.0	72.1
<b>Feeding habit in case of meal rejection</b>						
Do not care	18.8	67.1	14.1	25.6	69.8	4.6
Force my self to eat	17.6	65.9	16.5	18.6	72.1	9.3
Identify the meal is necessary	9.4	76.5	14.1	14.0	76.7	9.3
Intake delivery meals	17.6	63.5	18.9	2.4	76.7	20.9
<b>The preferable cooking methods</b>						
Blanching	17.9	31.9	50.2	16.6	16.3	67.1
Frying in fats	20.0	27.1	52.9	13.3	23.9	62.8
Grilling	23.5	20.0	56.5	11.6	20.9	67.5
Oven	10.6	17.6	71.8	9.3	20.9	69.8
Steam	3.5	10.6	85.9	4.7	4.7	90.6
<b>The preferable beverage consumption</b>						
Tea*	55.3	28.2	16.5	32.6	32.6	34.9
Natural juices	22.4	23.5	54.1	14	30.2	55.8
Canned juices	27.1	23.5	49.4	23.3	30.2	46.5
Soft drinks*	35.3	18.8	45.9	11.6	23.3	65.1

\*Statistically significant

### 3- Food preference:

The preference of food could be considered as one of the affecting factors on the nutrition custom and habits. The results show a higher variation with statistically significant differences in eating preferences of some foodstuffs and the rate of their consumption among Saudi and non-Saudi. It was found that, except of rice, there was no significant difference in the preference of food, and the following a detailed recorded of these results could be found: -

#### a- Milk and milk products:

Milk and milk products are one the main source of proteins which provides the individuals by their daily requirements of high biological value proteins, calcium and vitamins B<sub>2</sub> and B<sub>12</sub>. The

fortified milk, also, provides by a large amount of vitamins A and D. The presented data in Table (5) shows that there is a statistically difference between Saudi and non-Saudi patients in milk and milk products preference. Wherein, an increment in preference was detected in case of the Saudi acidified milk (80%) and yoghurt (71.8%) consumption compared to non-Saudi with statistically significant differences. The preference percentage of milk (88.4%) and cheese (88.4%) was higher for non-Saudi in relative to the Saudi patients with a statistically significant difference. It was also became clear from the Table that there were differences in the rate of consumption, including either daily or weekly consumption.

**Table (5): Food preference among Saudi and non-Saudi patients \***

Item	Saudi			Non Saudi		
	Yes	Not	Consumption rate	Yes	Not	Consumption rate
<b>Milk and milk products group preference</b>						
Milk**	85.9	12.1	Daily	88.4	11.6	Daily
Laban***	80.0	20.0	Daily	74.4	25.6	Weekly
Yogurt*	71.8	28.2	Weekly	65.1	34.9	Daily
Cheese*	75.3	24.7	Daily	88.4	11.6	Daily
<b>Meat and their alternatives group preference</b>						
Red meat**	82.4	17.6	Weekly	72.1	27.9	Weekly
Chicken	85.9	14.1	Daily	86.0	14.0	Daily
Fish**	78.8	21.2	Weekly	74.5	25.5	Weekly
Eggs	71.8	28.2	Daily	79.1	20.9	Daily
Legumes**	65.9	34.1	Weekly	46.5	53.5	Weekly
<b>Bread and cereal group preference</b>						
White read**	68.2	31.8	Daily	74.4	25.6	Daily
Whole read**	52.9	42.4	Daily	37.2	62.8	Daily
Rice	94.1	5.9	Daily	90.7	9.3	Daily
Pasta**	71.8	28.2	Weekly	76.7	23.3	Weekly
Cornflakes**	30.6	69.4	Weekly	53.5	46.5	Daily
Indomie**	50.6	49.4	Daily	62.8	37.2	Daily
<b>Fruit and vegetables group preference</b>						
Fresh vegetables**	71.8	28.2	Daily	83.7	16.3	Daily
Cooked vegetables**	61.2	38.8	Weekly	67.4	32.6	Daily
Fresh Fruit**	76.5	23.5	Daily	79.1	20.9	Daily
Preserved fruit**	22.4	77.6	Weekly	30.2	69.8	Weekly
Dates**	60.0	40.0	Daily	48.1	41.9	Weekly
<b>Miscellaneous food group preference</b>						
Honey	60.0	40.0	Daily	58.1	41.9	Daily
Jam**	41.2	58.8	Daily	48.8	51.2	Weekly
Nuts**	47.1	52.9	Weekly	41.9	58.1	Monthly
halva	49.4	50.6	Weekly	51.2	48.8	Weekly
Olive oil**	55.3	44.7	Daily	44.2	55.8	Weekly

\*, \*\* and \*\*\* = significantly at 0.05, 0.01 and 0.001.

**b- Meat and their alternatives:**

Meat and meat products are one the main source of biological value proteins. Beans could be used as successful meat substitutes, due to their protein high content and fat low content, and the complementary meals usually recommended to have a combination of animal and vegetable proteins. It is because such combination supplies the individuals with plenty of iron, zinc, magnesium and vitamin H. Such nutrients are of important elements in the acceleration of patients curing suffering from pulmonary tuberculosis. It was found from Table (5) that there is a significant difference at the meat and their alternatives preference of eating. It was found a high preference of the Saudi to red meat, fish, legumes compared to non-Saudi patients. While there is a difference in the rate of consumption, including either daily or weekly consumption for non-Saudi in case of chickens and eggs, as observed from the same Table.

**c- Bread and cereal group**

The whole grain or fortified flour could be considered a good source of vitamins B complex, iron and magnesium. It is also considered a mineable source of protein, which is characterized by low biological value. One of the recent recommended is the intake of whole grain products like high fiber bread. It is because they contain a high percentage of fiber, vitamins and minerals. Data presented in Table (13) confirmed that there is a variation in the proportion of bread and cereals group preference. Such preference, for bread and white pasta and cornflakes vermicelli, instant (Indomie), was higher in case of non-Saudi compared to the Saudi with a high significant differences. On the other hand, the preference of the Saudi to whole bread intake did not show any statistical significant differences for rice and their consumption rate.

**d- Fruits and vegetables group:**

Fruits and vegetables group are characterized by their low fat and protein content and as good sources of vitamins, minerals, antioxidants compounds and dietary fiber. Table (5) indicated that the research sample of Saudi and non Saudi showed a high preference for fruit and vegetables group. Since, the preference of non-Saudi for fresh vegetables used in salad, cooked vegetables and fresh fruit was higher than that of Saudi patients. While the preference of the Saudi to dates was higher but the majority of research sample did not preferred the preserved fruits, especially the Saudi patients.

**E- Miscellaneous food group:**

This group includes oils, fats and sugar, which is usually added during the process of preparing food to complete the nutrient requirements of the person's daily calories. Table (5) showed a high preference of the Saudi for honey, nuts and olive oil compared to non-Saudi. While the non-Saudi preferred jam and halva with statistically detectable significant differences.

**4- Effect of hospital residence on body weight:**

A marked improvement in the weight average of Saudi and non Saudi patients, after entering the hospital under the direct supervision, were detected as shown in Table (6). The initial average weight (when entering the hospital) was recorded 53.85 (SD  $\pm$  13.80) and 50.72 kg (SD  $\pm$  11.72) for Saudi and non-Saudi patients, respectively. The final average weight (after the hospital stay) of Saudi patients was changed to 56.49 kg (SD  $\pm$  13.97). The final average weight (after the hospital stay) of non-Saudi reached to 54.16 kg (SD  $\pm$  13.15) compared to the initial one (before entering the hospital) with statistically significant differences (T = 4.64; p = 0.001), suggesting that the patients recovered some of their weight loss.

**Table (6): The average body weight\* of Saudi and non-Saudi patients after admission to hospital**

Nationality	Weight when entering the hospital	Weight at the end of the study	T test	Significance
Saudi	53.85 $\pm$ 13.80	56.49 $\pm$ 13.97	4.64	0.000
Non Saudi	50.72 $\pm$ 11.74	54.14 $\pm$ 13.15	5.46	0.000
MEAN $\pm$ SD	52.86 $\pm$ 13.22	55.78 $\pm$ 13.72	6.69	0.000

\* MEAN $\pm$ SD**5- Effect of hospital residence on body mass:**

As seen from Table (7), there was a significant increase in the average body mass index before entering the hospital among Saudi patients 20.13 kg/m<sup>2</sup> (SD  $\pm$  5.74) compared to non-Saudi 18.43 kg/m<sup>2</sup> (SD  $\pm$  3.95). The same Table, also, showed a non statistically significant improvement

in the body mass index average among Saudi patients (21.32 kg/m<sup>2</sup>  $\pm$  SD 5.31) compared to non-Saudi (19.89 kg/m<sup>2</sup>  $\pm$  SD 4.06) at the study end (after the hospital stay), which confirms that the patients recovered some of their weight after a hospital stay.

**Table (7): The body mass index average\* of Saudi and non-Saudi patients after admission to hospital**

Nationality	BMI when entering the hospital	BMI at the end of the study	T test	Sig
Saudi	20.13±5.74	21.32±5.31	4.48	0.000
Non Saudi	18.43±3.95	19.89±4.06	5.87	0.000
MEAN±SD	19.58±5.08	20.87±4.96	6.55	0.000

\* MEAN±SD

#### 4. Discussion

The region of Mecca, including Taif province, occupied the first ranked as the most regions of the Kingdom of Saudi Arabia suffering from tuberculosis disease. It was due its geographical location and the presence of a large proportion of foreign employers, mostly from countries with endemic disease. As a result of the keenness of the wise leadership on the community health and safety, a royal decree (No., 7 / 58 505, dated 12.03.1424 e) ensures free treatment for those infected with the disease of the resident "non-Saudi" until curing. The Ministry of Health Kingdom data of Saudi Arabia for the year 2008 refers to that the rate of injury in Mecca was 49.3% (Health Statistical Year book, 2008) and the results of the current study confirmed that this ratio showed to slightly higher than that recently detected. Since, the Mecca region includes Taif, Jeddah and the Holy City, the results indicate that 34.59% of the individual hospital residence were non-Saudi. Such results were to be different than that found in the study of Qari (2002) which was carried out at King Abdulaziz Hospital in Jeddah. It showed that the proportion of non-Saudi amounted 64%, suggested the need to find successful mechanisms to prevent the entrees of foreign employers suspected to be pulmonary TB into Saudi territory.

The Ministry of Health adopted a national program to combat tuberculosis through stages objectives aimed to enhance the level of healing to more than 85%. It could be done by following the modified treatment short-term strategy under the direct control, and early detection of more than 70% of infected cases (Abba *et al.*, 2010). Despite all the efforts made by the Kingdom of Saudi Arabia, according to Health Ministry reports in its report for the year of 2008, the disease still possess a danger factor to the society, especially in slums and poor neighborhoods in major cities. Most infected cases was detected among individuals aged 15-44 years. It was, also, noted that tuberculosis is associated with poverty and working and hard

living conditions. The incidence forced the patients to the lowest levels of poverty because it means many years of disease and long months of treatment. Such finding is consistent with the results of the current study, which found that the most age groups infected by the disease, especially among non-Saudi individuals, were in who ranged in the age of 20-50 years. It simply meaning at the suitable working and production age and the monthly income of more than 86% was around 2,500 LB (riyals). Such case represents an economic burden on the Kingdom of Saudi Arabia, especially as the cost of the free treatment of the disease may doubled if the patient is infected with a highly resistance strain. The presence of imported strains from the disease entered the Kingdom (Al-Hajoj and Rastogi, 2010; Al-Hajoj, 2010), more attention are required to that slides and oriented the charitable institutions and civil society to exchange relief material to raise the economic level of the patients. It was especially since the results of the current study agreed with many of studies. The study of Leung *et al.*, (2004) concluded that the social and economic factors (education, occupation, unemployment and income) affected on the rates of infection. The study of Peabody *et al.*, (2005) found that the economic costs have affected the high incidence of the disease. The study of Chakraborty *et al.*, (2006) that the lower monthly family income are more closely related to a rate of infection and the study of Jackson *et al.*, (2006) recommended to condense the economic programs to reduce the incidence of the disease. The study of Santos *et al.*, (2007) suggests that socio-economic is a responsible factor for 87% of the cases and the study of Hoa *et al.*, (2011) concluded that tuberculosis disease is widely spread among people living below the poverty line.

Numerous studies and reports explained that the risk of TB is affected by the nutritional status and the lack of nutrition, weight and body mass index, awareness of health and nutrition and dietary behavior. Eating habits and preference of food is one of the risk factors that contribute to its development. The results show that the health awareness and nutrition among patients were ranged between medium and low. It may be due to the level of education, which requires further programs of nutrition education and health about infectious diseases and methods of prevention of them, and the sources of nutrients, antioxidants and importance of food and treatment. This findings differed with that found by Ailinger *et al.*, (2003) who detect a higher level of health awareness among patients. While the study of West *et al.*, (2008) confirmed that in spite of the high level of health awareness as a result of disease infection, there are some wrong information

related to modes of transmission, infection and treatment the disease among patients. The studies of both Mesfin *et al.*, (2009) and Long *et al.*, (2008) referred to that TB patients have low levels of knowledge and awareness. The study of Qureshi *et al.*, (2008) concluded that the low level of health awareness about the disease among patients can affect the patient health through following some of the behaviors that can assist in infection the other healthy people. The study recommended, also, to focus on increasing the awareness on TB disease in the community to reduce the delay in seeking the disease and treatment it.

The behavior and food consumption pattern affects on the improvement of the nutritional and health status of the Saudi and non-Saudi patients. The results showed the existence of some good food habits among Saudi and non-Saudi patients. It was also noted that there was a discrepancy and the statistically significant differences in food preference for the four food groups. Consequently, it affecting on the nutritional status of the patients during their hospitalization and improved both of weight and body mass, suggesting the influence of dietary behavior in the hospital in improved the nutritional status. Such results are consistent with the study of Edimo *et al.*, (1996) who conducted on 20 patients and conclude that there were a high consumption of fruits and vegetables by the research sample (70%). The fruits and vegetables consumption frequency was once a week at least and 55% of the study sample intake there protein requirements through many sources. The rate of consumption of starchy foods was lowered to be 30% of the study sample and the study confirmed the existence of a change in some dietary habits, once the individual study sample aware that they being exposed to disease infection. The <http://www.diethealthclub.com>, 2010 nutrition site offers some advices related to pulmonary tuberculosis patient feeding. Some of such advices are eating meals with small portion and easy to digest, avoiding fatty foods, spices and the eating high amounts of fruits and vegetables such as starchy vegetables, citrus, and leafy green vegetables, legumes, whole grains, milk and dairy products with adequate rest and stay at home. Pat (2009) confirms on the importance of weight gain, and consults a dietician or nutritionist to take an adequate diet to meet the requirements of the patient's nutritional and health.

The weight factor is one of the most important physical measures, which must be recorded in case the incidence of chronic diseases, especially tuberculosis patients. It was because patients with active TB are very thin and possess a

low body mass index compared to healthy people (Eick *et al.*, 2009 and Ng and Paton 2006). The results showed that the body mass index was within normal limits before entering the hospital, with a significant improvement in body mass index after the hospitalization of the patients. On contrary of such result, the study of Niyongabo *et al.*, (1999) conducted on 33 patients with pulmonary TB showed a physical measurement ( $18.6 \text{ kg/m}^2$ ) than the standard values. The study of Metcalfe (2005) conducted on 50 patients with TB showed a lower average body mass index ( $16.2 \text{ kg/m}^2$ ) in patients compared to that found in the healthy people ( $24 \text{ kg/m}^2$ ) and the study recommended the patients to receive nutritional supports through the nutrients medicine supplementation to improve the health status of patients. The study of Yüksel *et al.*, (2003) referred that TB patients are suffering from low standards physical measurement prior to treatment and after six months of treatments an increase in weight was detected. The study of both of Leung *et al.*, (2008) and Khan *et al.*, (2006) noted that the weight loss and food depletion of is common phenomena in patients with tuberculosis at the stage of diagnosing the disease. It was also reported that obesity is associated with a lower risk of active tuberculosis Pulmonary among the elderly and the possibility of patients relapse is high among persons of low weight or body mass index. It was concluded that it is easy to identify these patients in the low resources environments as mentioned by Chi-Chiu and Kwok-Chiu (2008) that obesity could be considered a good tool to prevent of the disease infection.

#### Corresponding Author:

AL-Zahrani Maria  
Food Science and Nutrition, Umm Al-Qura  
University, KSA

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