5. DISCUSSION

Periodontal diseases are the most common diseases in the oral cavity; they constitute the major oral health problem in most of the countries. Periodontal disease is multifactorial in nature. This study attempts to select a few etiological risk factors and study the association with periodontal status of the population in Sebha city, Libya. The factors that have been considered here are: oral hygiene practices, smoking and systemic disease like diabetes and hypertension.

The study by Hassan AK 2000, among patients attending dental clinic in Sebha, Libyan Arab Jamahiriya, reported that the people have poor oral hygiene and low level of education. There is a high rate of tooth extraction resulting from 54% dental caries and 41% periodontal disease.

The report by Leous (1993), on the oral health situation in Socialist People’s Libiyan Arab Jamahiriya was a pathfinder study which concluded that the periodontal disease is a major problem in Libya. Three decades have past after the submission of the assignment report to WHO. During this period there is no mention in the literature about any further development intems of achievement of oral health goal set for 2000, any programs developed and implemented or any survey conducted on a nationwide level to evaluate the oral health condition. With the given background it is clear that there is no oral health database for Sebha city and that periodontal disease is a main problem.

This is the first study which has been designed on a large scale to provide baseline information about periodontal disease status and its associated risk factors.
5.1 PERIODONTAL STATUS

In the present study 8.8% of the subjects had healthy periodontium, 8.9% had bleeding, 38.5% had calculus and 43.8% had shallow and deep pockets (CPI score 3 and 4).

5.2. PERIODONTAL CONDITION AND AGE

5.2.1 IN AGE GROUP BELOW 16 YEARS

42.4% had healthy periodontium (Score 0), 31.7% had bleeding on probing, 23.5% had calculus and 2.5% had pockets (only 16 years old), whereas in study conducted in Lao by Chuckpaiwong et al., (2000) only 0.27% had healthy periodontium and 99.21% had calculus. In a study among children in Jordan (Hamasha & Albashaireh, 2006) 27.5% had healthy periodontium, 22.9% had bleeding, 31.4% had calculus and 18.2% had pockets. The prevalence of healthy periodontium in Sebha city as reported in the present study was lesser compared to the study report by Hamilton and Coulby where around 60% of the children had healthy periodontium.

5.2.2 IN AGE GROUP OF 17-30 YEARS

Only 5.5% had healthy periodontium, 7.1% had bleeding on probing, 43.5% had calculus and 43.8% had periodontal pockets. The percentage of Sebha population with healthy periodontium was less when compared to 20-29 years age group in Jordan (El-Qaderi & Qutiesh Ta’ani, 2004) where 41.1% had healthy periodontium and the high school students of Iran (Kazemnejad et al., 2008) where 11.3% had healthy periodontium. In contrast to this, only 0.5% of 19-27 years old Lao population
(Chuckpaiwong et al., 2000) reported healthy periodontium. When periodontal pockets were considered in this study, 43.8% had periodontal pockets which was more when compared to a study conducted in Jordan (El-Qaderi & Qutiesh Ta’ani, 2004) where 7.4% among 20-29 year old had periodontal pockets and among Loa population where only 0.75% had pockets (Chuckpaiwong et al., 2000).

5.2.3 IN THE AGE GROUP OF 31-50 YEARS

Only 2% had healthy periodontium, 3.6% had bleeding on probing, 39.1% had calculus and 55.3% had periodontal pockets. Surprisingly, none of the study reports from Egypt (WHO, 2001), Kenya (Baelum et al., 1993), Libya (WHO, 2001), Morocco (Haikel et al., 1989), Namibia (WHO 2001), Niger (WHO, 2001) reported healthy periodontium. Regarding periodontal pockets in the present study, 55.3% had pockets. This percentage was lesser as compared to the population from Kenya (Baelum et al., 1993), Libya, Mauritius, Nigeria (WHO, 2001) and Morocco (Haikel et al., 1989) but more when compared with populations of Ghana, Lesotho, Malawi, Namibia and Niger (WHO, 2001). Few African countries had better periodontium and few had worse periodontium. The reason for such variations in the results may be attributed to the variation in socio-economic status of the population, varying levels of oral hygiene awareness and habits, smoking and use of tobacco, different racial predilections and the presence of confounding factors such as diabetes, malnutrition, stress etc.
5.2.4 IN THE AGE GROUP OF ABOVE 51 YEARS

In this present study none of the subjects had healthy periodontium, 1% had bleeding on probing, 12.2% had calculus and 86.7% had periodontal pockets. This finding coincides with a study in Laos (Chuckpaiwong et al., 2000). But in studies from Jordan (El-Qaderi & Quteish Ta’ani, 2004) and Finland (Ajwani, 2003), the subjects with healthier periodontium were 11% and 7% respectively. Regarding periodontal pockets in this age group, 86.7% had periodontal pockets, which is on the higher side as compared to the study populations of Jordan (El-Qaderi & Quteish Ta’ani, 2004), Finland (Ajwani, 2003) and Lao population (Chuckpaiwong et al., 2000) where only 29.7%, 46% and 30.14% had periodontal pockets. To conclude, this age group had the worse periodontal status. In this study as the age increases the percentage of the healthier periodontium decreases and percentage of pockets increases, i.e. age is inversely proportional to periodontal status. This finding is coinciding with studies conducted in Jordan (El-Qaderi & Quteish Ta’ani, 2004) Laos (Chuckpaiwong et al., 2000) and in Iran (Sanei & Nasrabadi, 2005). That is as age increases the periodontal condition deteriorates.

In this study the periodontal pockets were seen more in males than in females, the sample with healthier periodontium was more in females than in males. So it shows females had better periodontal status than males. The reason may be females are more concerned about their oral health as aesthetics is very important for them. This finding coincides with the result of the study conducted in Iran (Sanei & Nasrabadi, 2005). May be the reason was oral habits like smoking in males which worsened the condition.
5.3 ORAL HYGIENE PRACTICES

The use of oral hygiene aids for cleaning as reported by the study participants was found to be quite high. 93.7% of the subjects were using some or other cleaning aid and most of the population (85.3%) were using tooth brush. These results were similar to those seen in studies conducted in West Africa. (Normak & Mosha, 1989; Sarita and Touminen, 1992; Kikwilu, 2008)

Tooth Brush was by far the most common cleansing aid (85.3%) used among this population. This was similar to the tooth brushing habits reported by 83.8% adults in Saudi Arabia (Farsi et al., 2004) and 82% Chinese population aged 35-44 years (Lin et al., 2001). In contrast to this, 99% of the young mothers of Tanzania (Mumghamba et al., 2006), 100% adults in Denmark (Christensen et al., 2003) and 93% population of Saudi Arabia (Al-Otaibi, 2003), reported tooth brushing. Few studies showed that there were populations who used less tooth brush than the present study. A study in Burkino Faso showed that 36% of 12 years old and 57% of 35-44 year old were brushing their teeth (Varenne et al., 2006). In a study among military personal in Saudi Arabia only 73% did brush their tooth on a daily basis and shockingly 44% of 51-60 years old people never used a tooth brush. They were using Siwak (chewing stick) exclusively (Al-otaibi et al., 2003). In a study in Benghazi (North eastern Libya) 42% of the sample of 6-12 years children were not brushing their teeth. (Al-Sharbathi et al., 2000). This wide variation among populations in the usage of tooth brush depends on their socio economic conditions, levels of health awareness and the cultural habits.
Around 85% of the sample in the present study used tooth paste for cleaning the teeth which was comparatively lesser than the group of young mothers in Tanzania and adults in Denmark (Christensen, 2003; Mumghamba et al., 2006). But it was almost equal to Urban population of Tanzania (Elifaraha), but more than rural population of Tanzania where only 1/3 of population used tooth paste (Elifaraha) and the studied population in Burkino Faso where only 15% used tooth paste (Verenne et al., 2006). This shows that toothpaste was less used in rural areas and its usage increased as the populations moved to urban areas which agrees with study done by Elifaraha.

5.4 FREQUENCY OF BRUSHING

In the present study 30.8% were brushing twice and 7% were brushing more than twice which was less when compared to adolescents in China where 50% brushed twice (Zhu et al., 2003), adults in Denmark where 68% brushed twice (Christensen et al., 2003) and a study conducted by Gnass et al., (2008) where 80% were brushing twice a day.

The results in the present study were better when compared to adults of 35-44 years in China where around 32% were brushing twice (Zhu et al., 2005) and school children of Saudi Arabia where only 24.5% brushed twice a day (Amin & Al-Abad, 2008).

In this study females were using tooth brush more than males and frequency of brushing was also more in females than in males which is a general prevalent trend in all countries across Middle East and Europe except in France where both genders
brushed equally (Kuusela et al., 1997; Al-Otaibi et al., 2003; Zaborskyte & Bendoraitiene, 2003; Al-Otaibi & Angmar-Månsson, 2004; Farsi et al., 2004) and it also coincides with the study report among Libyan population (Eldarrat et al., 2008). The habit of toothbrushing more frequently than the males may be contributed to the fact that females give more importance to oral hygiene as it improves the aesthetics and their nature of seeking frequent dental treatment (Eldarrat et al., 2008).

In this study only 6% used Siwak and 24.3% used it as an adjunct aid for brushing, which is less when compared to its use among Saudi populations (36% Saudi school children in Jeddah city, 65% of Urban Saudi population used Siwak, 100% at the military centre, 90% of the university staff used siwak on a daily basis) (Al-Otaibi et al., 2003; Farsi et al., 2004; Al-Otaibi & Angmar-Månsson, 2004). Incidentally the results of the present study reflected the findings of another study in Libya (Eldarrat et al., 2008). But in Tanzania, these chewing sticks were mainly used in Rural populations (Elifuraha, 2009). Among primary school children in Saudi Arabia 44.6% used Siwak (Amin & Al-Abad, 2008) but in the present study among children of same age group only 16.4% were using Siwak.

In the present study more males were using siwak than females which is similar to the findings seen in studies conducted by Al-Otaibi et al., (2003), Eldarrat et al., (2008) and Farsi et al., (2004). Miswak is known to have antibacterial effect on pathogens causing periodontal disease and caries (Almas and Al-Zeid, 2004; Sofrata et al., 2008).
Because of scientific merit of using miswak as a cultural and religious belief in the population, the right method of using miswak as a cleaning technique to achieve maximum benefits should be stressed through various interventions (Farsi et al., 2004).

5.5 DENTAL FLOSS

In the present study only 2% of sample used dental floss which was quite less when compared to 11% of its use in primary school children in Al Hassa, Saudi Arabia (Amin & Al-Abad, 2008) 19% among school students in Jeddah, Saudi Arabia (Farsi et al., 2004), 11% in Denmark (Christensen et al., 2003) and in Sweden (Hugoson et al., 2005). The reason for less use of dental floss in the present population is apparently due to the lack of knowledge and better oral hygiene habits.

What is surprising is that 8% of the studied population used charcoal, finger, tissue paper, tooth picks as an adjunct aid which underlines the need for immediate impartation of oral hygiene instructions.

5.6 CPI SCORE WITH ORAL HYGIENE PRACTICES

In the present study there was a significant relationship between tooth brushing and periodontal status (P=0.003). Periodontal pockets were more in people who were not brushing (P=0.006). The difference was statistically highly significant (P=0.004) but calculus was more in people who were brushing than the people who were not brushing. As calculus cannot be removed with brushing alone it requires professional intervention. The present study shows that brushing definitely has positive effect on periodontal status.
5.7 CPI IN RELATION TO CLEANING AID USED

There was a statistically highly significant relationship between periodontal status and cleaning aids used (P=0.0093). Periodontal pockets were more in the sample who were not brushing their teeth when compared with people using tooth brush and siwak. The difference was statistically significant (P=0.0001 and 0.04) respectively. But there was no significant difference in the periodontal status among people using tooth brush and siwak. This shows siwak is as effective as tooth brush and also its advantageous over toothbrush as it is culturally more acceptable, easy to use, easily available and cost effective. But one thing which was again surprising was that calculus was more prevalent in people who were using brush, siwak than people who did not brush, the reason clearly remains unknown.

5.8 CPI IN RELATION TO FREQUENCY OF BRUSHING

There is a statistically significant (P=0.013) difference between frequency of brushing and periodontal status. Deep pockets (Score=4) were more common in people who were not brushing than people who were brushing once, twice or more than 2 times (Z=2.556, 2.234, 2.783) respectively. But when people who were brushing once, twice and more than two times were compared against each other there was not much difference in periodontal status. This shows that brushing has a positive effect on periodontal status but frequency of brushing does not matter much or is not that significant.
5.9 CPI WITH AGE

There was a statistically significant relationship between age and periodontal status (P=0.0001). This study clearly shows that healthier periodontium was seen in younger age groups and periodontal pockets were seen more in the older age groups. As the age increases the periodontal status deteriorates, people with healthier periodontium decreased and there was a gradual rise in the people with periodontal pockets. The reason is also supported by frequency of brushing which states that as the age increased the frequency of brushing decreased. That is in the sample subjects who were more aged, their frequency of brushing was less and maximum people who were brushing twice and more than two times were belonging to adult age group of 17-30. This shows their urge to maintain good oral hygiene as it very important for having good smile and aesthetics. Also the role of systemic diseases during the older age cannot be ignored.

5.10 CPI WITH SEX

There is statistically significant correlation between sex and periodontal status (P=0.001). There was no significant difference among males and females in relation to people having healthier periodontium and bleeding on probing (Score 0 and 1). But calculus was seen often in females (P=0.008) than males. Periodontal pockets were seen more commonly in males (P=0.000) than in females. The reason for more periodontal pockets in males would be due to their habits of smoking and care free attitude towards their oral health, but the reason for more calculus in females is unknown.
5.11 PERIODONTAL CONDITION IN RELATION TO SYSTEMIC DISEASES (Diabetes and Hypertension)

Periodontal disease is the 6th complication of Diabetes. In the present study the percentage of diabetics was 5.16% only. There was a statistically significant difference between the CPI scores for diabetics and non-diabetics. Bakhshandeh et al., (2007) in his study among the dentate diabetics has indicated that the people with diabetes have higher percentage of shallow and deep pockets as compared to the healthy. There was none with healthy periodontium (Code - 0) which is a similar finding as per our study. Shahabooei et al., 2005 in their study has indicated that the mean CPI score among the diabetics was significantly higher as compared to the normal. It is stated that Diabetes increases salivary sugar and changes its bacterial flora, which may be responsible for periodontal tissue destruction.

Studies have reported that people who have heart disease have a 1.5 - 4 times increased risk for periodontal disease. (The risk is highest for patients with extensive gum disease, bleeding from every tooth.) Acute coronary syndrome, high blood pressure (hypertension), and high cholesterol have also been associated with periodontal disease.

Periodontal disease has also been linked to stroke and coronary artery disease (CAD). The more severe the periodontitis, the greater the risk for heart problems. However, it is still not clear whether periodontal disease is a risk factor for stroke or a marker that reflects various risk factors common to both conditions.
Only 3.13% of the sample was detected to have hypertension. None of them had healthy periodontium (code - 0). Majority were having shallow and deep pockets. This finding is similar to the study reported by Fabio Angeli et al., (2003). This study indicates that chronic periodontitis has been associated with an increased risk for cardiovascular disease. Periodontal disease is a multifactorial disease. Systemic conditions by itself do not cause periodontal disease. They cause exacerbation of the existing conditions. There are however some reports in the literature that show that there is no association between periodontal disease measures and incident hypertension (Sona Rivas-Tumanyan et al., 2012).

5.12 SMOKING AND PERIODONTIUM

It was recorded in the biography of Columbus published by his son Ferdinand that the Red Indians on the island of Veraguas were always chewing a dry herb, which was sometimes mixed with powder and which, he believed, was the reason that the red Indians teeth were quite rotten and decayed (Dickson & Sarah Augusta, 1954). Since the first observation of adverse effects of tobacco on periodontium, literature continues to build up on the effects of smoking on periodontium on both the periodontal status and the treatment outcome (Mandel, 1994). Despite its known health hazards and life threatening effects, smoking still goes on un-abated in many parts of the world (Igwe, 1992). In the present study there was a statistically significant relationship between smoking and poor periodontal status. Healthy periodontium was common in non-smokers than smokers but bleeding on probing and calculus were more common among non-smokers. But periodontal pockets which are considered to be real representation of poorer periodontal status were more in smokers
than in non-smokers and the difference was statistically significant. The results of the present study, that periodontal pockets were more in smokers than in non-smokers is in agreement with a study by Axelsson et al., (1998) which reports that smokers have more alveolar bone loss and deeper pockets.

Also, a study by Nwhator et al., (2010), confirms that pockets are significantly more in smokers than non-smokers. Furtheron, this is confirmed by the study reports of Feldsman et al., (1983), Stottonberg et al., (1993) and Bergstrom et al., (1991). There are contrasting reports in the literature Markkanen et al., (1985) and, Preber et al., (1980), that mention more pockets are due to high level of plaque in smokers and not because of the habit of smoking.

In this study bleeding was more in non-smokers and the difference was statistically significant and results coincide with findings of Nwhator et al., (2010). Calculus was more in non-smokers in this study but the results contradict the findings of the study by Nwhator et al., (2010). But studies by Awartani et al., (1999), Feldman et al., (1983), Preber et al., (1980) state that there is no significant difference between calculus levels among smokers and non-smokers.

In the present study most of the smokers were males in fact all of the smokers were men. This is in similar to the study by Awartani & Al-Jasser, (1999) and this reflects the culture of the study population.

In this study, the percentage of smokers with healthy periodontium was more than the non-smokers, which is a surprising finding. This is contrasting to the results
of Nwhator et al., (2010). The presence of healthier sextants in smokers than among non smokers is like a paradoxical relationship, the reason for this is not clear.

Pathological periodontal pocketing has been identified as most important indicator of periodontal disease (Manson & Eley, 1999). In the present study pockets were more in smokers than non-smokers which is in agreement with previous studies by Savage, (1999), Feldman et al., (1983) and Stottenberg et al., (1993). The difference observed could have two possible explanations. The first one may be due to poorer oral hygiene among smokers which is due to smoking per se. The second reason is that the pockets develop due to other factors and not the plaque and calculus (Barbour et al., 1997; Mayropoulos et al., 2003). The latter explanation may be applicable to our study samples.

5.13 FREQUENCY OF SMOKING

In the present study, as the frequency of smoking increased from 0, 0-5 cigarettes per day, 5-10 cigarettes per day, 10-20 cigarettes per day and more than 20 cigarettes per day the periodontal status started deteriorating that is the number of healthier segments started becoming lesser and the percentage of periodontal pockets gradually increased. The relationship was statistically significant. This shows that frequency of smoking has relationship with periodontal status and relationship is directly proportional. This finding lacks external validity because this result is a reflection of a small number of samples (93 out of 2006).
One of the drawbacks of this study was that the major sample comprised of female participants as versus the males. It was only the male subjects who reported the smoking habit in Sebha city.

5.14 STRENGTH OF THE STUDY

Periodontal disease is a major problem in Libya. This is the first ever epidemiological study to be conducted in Sebha city taking into account a large sample size with representation from all age groups. This has provided a baseline data which can be used for planning a comprehensive dental program for the population of Sebha. A systematic way of sampling and the number of people who took part in the study was fairly high, making it possible to generalise the findings amongst urban populations in the same region and of the same age.

5.15 RELIABILITY AND VALIDITY

It is generally accepted that while diagnosing periodontal disease with different codes, variation in the results is observed for a dentist (intra-examiner variability), it does increase with multiple dentists (inter examiner variability). One of the strengths of the present study was that the dental examinations were all conducted by the same dentist who had long experience in the field.
LIMITATIONS IN THE STUDY

Errors inherent in probing

Although periodontal probing (Carranza & Takei, 2006) appears to be simple, it has several complicating factors which in most of the cases become a source of error in the variable that is being assured (Listgarten 1980; Grossi et al., 1996). These factors include probing force (WHO, 1997) angulations of the probe to the pocket wall (Watts, 1987) and level of inflammation at the base of the pocket (Caton et al., 1981).

In the present study there was no opportunity to use pressure sensitive probes, the investigator has taken care to use standard and uniform method for probing, but controlling for this error was beyond the scope of the investigator.

Community Periodontal Index of Treatment Needs (CPITN)

The community periodontal index of treatment needs (CPITN) is one of the indices that can be used for the assessment of both the periodontal status and the treatment needs (WHO, 1987). After worldwide use of CPITN in more than 100 countries, there are claims that apart from being widely accepted, it is also effective in monitoring the magnitude, prevalence and severity of periodontal diseases globally (Pilot & Miyazaki, 1994). This view is not shared by Papapanou, (1996) and many others. It is significant that since 1990 no large epidemiological study in the USA or the UK has used CPITN as an epidemiological tool because of its short comings. It’s only virtue is that it is simple to use (Benigeri et al., 2000). Its limitations were clearly described by its initiators (Ainamo & Ainamo, 1994) and others (Schürch et al., 1990; Holmgren & Corbett, 1990; Holmgren, 1994; Baelum et al., 1995).
The assumption that a person having calculus will always also have gingival bleeding on probing has been disproved; as has the assumption that someone with shallow (4-5 mm) or deep (≥6mm) PPD will always have calculus (Takahashi et al., 1988; Grytten et al., 1989; Baelum et al., 1993; Lewis et al., 1994). Therefore it has been reported, for example, that CPITN/CPI scores 3 and 4 overestimate the prevalence of gingival bleeding and calculus (Grytten et al., 1989; Baelum et al., 1993). Furthermore, the CPITN/CPI index underestimated the prevalence of deep periodontal pockets in a number of studies (Gaengler et al., 1988; Miller et al., 1990; Diammanti-Kipioti et al., 1993; Baelum et al., 1993b; Bassani et al., 2006), but overestimated the treatment needs (Lewis et al., 1994). With regard to the signs of periodontal disease, it should be pointed out that the CPITN does not assess the loss of connective tissue attachment or tooth mobility (Cutress et al., 1987), furcation involvement in multi-rooted teeth or tooth loss. Furthermore, as unlike gingivitis and periodontitis, calculus is not in itself a disease, the score of CPITN 2 is frequently irrelevant as no one suggests that all those who have calculus present in their mouths but no gingivitis or periodontitis have any need for it to be removed.

Having realized the limitations of CPITN, some measures taken to solve the problem were to exclude the component of “Periodontal treatment needs”, and therefore the scope of the index was then limited to the assessment of periodontal disease only, leading to the “Community Periodontal Index”(CPI) (WHO, 1997). Furthermore, the World Health Organization had introduced in the Oral Health Surveys, Basic Methods booklet an additional index separate from CPI to assess the “loss of attachment” (WHO, 1997).
However, in the present study the investigator has limited to using only the periodontal assessment using the codes of CPITN. With the introduction of codes of Loss of attachment in 1997, along with the CPI, this index should have been considered to reveal a correct periodontal profile which is a clear limitation of the study. For population of 15 years and below only Code 0, 1, 2 of CPITN can be applied. This probably underestimates the assessment of gingivitis, which is more common in these ages and index like gingival index and Oral hygiene index is a more suitable tool for assessment.

The dental examination was a clinical examination only; no radiographs were taken. Hence, assessment of the alveolar bone was not measured, which is an important parameter of periodontal disease.
CONCLUSION AND RECOMMENDATIONS

Generally, the population of Sebha, Libyan Arab Jamahiriya have a poor oral hygiene that engenders oral diseases. Healthy periodontium is a rarity. Poor oral hygiene can expose the oral health of the majority of Sebha population to risk for further dental and periodontal diseases for the rest of their lives.

Unmet periodontal treatment needs are high in Sebha population, indicating the existence of barriers to accessible dental care.

Smoking is a risk indicator for oral health that accumulates in men. The risk being with greater number of cigarettes smoked per day, the longer duration of smoking, and the heavier lifelong exposure.

The higher need for periodontal treatment among men may be attributed in Sebha, Libya to their poorer oral hygiene and their higher prevalence of smoking.

1. For citizens

- Oral self care should be acknowledged from childhood, to become an established habit in adulthood.
- Adults should regard healthy dentition as an integral part of good general health and healthy ageing.
- Smokers should be supported to stop smoking to prevent further oral health deterioration caused by tobacco.
2. For dental professionals

- Dental professionals should put an emphasis on self care instructions during each patient’s visit and treatment, especially among those with a low socio-economic status.
- Preventive approaches should be highlighted in continuing education and during dental curriculum revision.
- Tobacco-use prevention and cessation activities should be integrated into the treatment procedures of patients according to international guidelines.

3. For policy makers

It appears that knowledge, attitude and behaviour concerning oral and periodontal health are in need of improvement.

- National oral health prevention programmes should be introduced. There is a need to reinforce the oral hygiene practices of Sebha population and make them effective in plaque removal using both the plastic tooth brush and the chewing stick.
- Oral health care should be integrated with other health care promotion programmes, employing the common risk factor approach.