Aims and Objectives: No reported data is available on the periodontal health and treatment needs of the intellectually disabled in Lebanon. To evaluate the periodontal condition and treatment needs of institutionalized intellectually disabled individuals in Lebanon.

Materials and Methods: A total of 272 individuals (141 males and 131 females) aged 15 years and 35–44 years were examined. Periodontal health was recorded following the community periodontal index of treatment needs (CPITN), and treatment need was assigned accordingly. The IBM® SPSS® statistics 20.0 and Stata/SE 11.1 statistical packages were used to carry out all statistical analyses. Statistical analysis was performed using linear regression (P ≤ 0.05).

Results: Healthy periodontium was recorded in 26.1%, bleeding on probing in 27.9%, supra-/sub-gingival calculus in 31.3%, pockets of 4–5 mm in 11% and ≥6 mm in 3.7%. The largest proportion of the sample was in need for oral hygiene instruction and calculus removal (42.3%). Age, geographical location, consumption of carbohydrate-rich meals and sweets between meals were significantly associated with CPITN score severity in multivariate analysis (P < 0.05). Gender, severity of disability, frequency of tooth brushing, and caretaker characteristics were not significant predictors of CPITN (P > 0.05).

Conclusion: The predominantly poor periodontal health and social inequalities warrant nationwide preventive oral health programs in addition to planning the provision of treatment services to meet existing treatment needs.

Keywords: Community periodontal index of treatment needs, institutionalized intellectually disabled, Lebanon, periodontal health

INTRODUCTION

The definition of disability is socially constructed and relies on the interpretation of impairment, which may manifest either as a physical or mental state or both.[1] Intellectual disability occurs when impairment impedes cognitive and adaptive functioning, and it is the most common developmental disorder that inhibits full participation in society for hundreds of millions of people.[2]

Good oral health is essential for appearance, speech, proper mastication, and digestion and has a strong impact on general health.[3] Periodontal diseases are the most common noncontagious group of conditions afflicting humans.[4] Several epidemiological studies have noted that individuals with disabilities tend to have poorer oral hygiene and a greater prevalence and increased the severity of periodontal disease than the general population.[5,6] The prevalence and severity of periodontal disease in the disabled are usually associated with factors such as age, type of disability, institutionalization, socioeconomic status (SES), availability of dental care,

Access for correspondence: Dr. Hicham A. Diab, Department of Dental Public Health, Faculty of Dentistry, Lebanese University, Beirut, Lebanon. E-mail: hidiab@hotmail.com

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Diab HA, Hamadeh GN, Ayoub F. Evaluation of periodontal status and treatment needs of institutionalized intellectually disabled individuals in Lebanon. J Int Soc Prevent Commun Dent 2017;7:76-83.
and type of treatment offered. Nonetheless, there appears to be a general agreement that dental treatment is one of the greatest unattended health needs of disabled individuals. On the one hand, this may be due to poor patient cooperation and underestimation of treatment needs. In addition, the demand for dental care can often be limited either by the disabled individual’s incapacity to accurately convey their symptoms or by the parent or caregivers to evaluate their oral condition.

The World Health Organization (WHO) has been collecting data on periodontal diseases since 1969, initially using the periodontal index of Russell and the simplified oral hygiene index but more recently these have been replaced by the community periodontal index of treatment needs (CPITN). Adopted by the WHO, the CPITN method of assessing periodontal condition provides standardized and comparable measurements of treatment needs that enable use by health planners and comparisons between populations. The index has been extensively used so that the WHO Global Oral Data Bank now contains comprehensive data from many countries around the world. On the other hand, the periodontal condition of intellectually disabled individuals has not nearly been sufficiently assessed, especially in developing and lower-income countries. According to official national estimates based on registration with the Lebanese Ministry of Social Affairs (MSA), there are at least 27,500 intellectually disabled individuals in Lebanon, an estimate that represents more than 28% of all disabled Lebanese individuals. However, despite recent growing research interest in the oral health of disabled individuals, the oral health and conditions of intellectually disabled persons in Lebanon have not yet been assessed.

The objective of the present study was to evaluate the periodontal health status and treatment needs of institutionalized intellectual disabled persons in Lebanon.

**Materials and Methods**

A nation-wide cross-sectional study was conducted between November 2015 and April 2016. The target population was set as all institutionalized Lebanese individuals with intellectual disabilities in the age groups 15 and 35–44 years residing across the six Lebanese governorates. Ethical approval of the research protocol was obtained from the Ethical Research Committee and the Faculty of Medical Sciences at the Lebanese University (protocol no. 53/2016, 12-07-2016) in addition to the MSA in Lebanon (protocol no. 589, 02-02-2015).

The MSA provided a list of the 49 registered institutions caring for disabled persons distributed throughout the Lebanese territory along with the number of registered disabled persons belonging to the age groups of interest. All but one institution, located in Mount Lebanon, approved of participation in the study. These 48 institutions combined cared for 291 individuals belonging to the target age groups (164 adolescents aged 15 years and 127 adults aged 35–44 years). All individuals were approached and were eligible for participation. Four individuals were absent, and 15 were noncooperative with the oral examination, resulting in the examination of a total of 272 individuals (age 15: 152 individuals; age 35–44: 120 individuals). Before the subject examination, written consent was requested from their parents, legal guardians, or institution caretakers.

**Data collection**

Clinical data were collected through an oral examination, and supplementary information on background characteristics and behavioral factors was collected through a questionnaire filled by each subject’s primary caretaker (either parent or guardian at the institution). The questionnaire explored background characteristics (age, sex, and governorate of residence), arrangement with the institution and characteristics of primary caretaker (relation to the disabled person and education), type of disability and severity, oral hygiene practices, and dietary habits.

The second stage of the study consisted of a clinical examination aiming to assess each subject’s periodontal condition. All examinations were carried out by a trained dental practitioner with more than 15 years of experience in providing oral care to disabled individuals (the researcher), who examined each person seated in a chair under adequate room lighting using mouth mirrors and the WHO probe to determine the bleeding response, the presence of supra- or subgingival calculus and probing depths. Disabled persons who were absent or unable to cope with the clinical examination and whose lack of cooperation prevented the adequate collection of all measures of interest were excluded from the study.

The criterion used to assess periodontal condition was the CPITN which is based on the measurements of bleeding, calculus, and pocket depth. The dentition was divided into six sextants (one anterior and two posterior tooth regions in either arch) defined by teeth numbers 17–14, 13–23, 24–27, 37–34, 33–43, and 44–47. A sextant was examined only if there were two or more teeth present and these were not indicated for extraction. When only one tooth remained in the sextant, it was included in the adjacent sextant. The highest CPITN sextant scores were used to classify each subject into one of four different treatment need categories [Table 1].
STRICTUAL ANALYSIS
Means and standard deviations were generated for CPITN scores across the two age categories and across all other variables of interest. Bivariate analyses between CPITN as the outcome and the various background and behavioral factors were conducted using simple linear regressions to estimate the degrees of freedom, F statistics and P values. Variables associated with CPITN at P < 0.2 at the bivariate level were included in the subsequent multivariate modeling. The final multiple linear regression was then used to estimate regression coefficients, standard errors, 95% confidence intervals (CIs) and two-sided P values. Statistical significance was set at 0.05. The IBM® SPSS® statistics 1.0.0 and Stata/SE 11.1 (U) (USA) statistical packages were used to carry out all statistical analyses.

RESULTS
DESCRIPTIVE CHARACTERISTICS
A total of 272 individuals, 152 (55.9%) adolescents age 15 years and 120 (44.1%) adults between the ages of 35–44 years were examined. The sample was almost equally distributed between males (51.84%) and females (48.16%). Overall, 26.1% of the subjects had healthy periodontal tissue and bleeding on probing was recorded in 27.9% [Table 2]. Although CPITN scores were worse in the older age category, even at age 15 years 7.2% of the examined individuals displayed at least one periodontal pocket of 4–5 mm. In the adult sample, 24.1% of those examined presented with periodontal pocketing of at least 4–5 mm, 8.3% of whom displayed pocket depths of at least 6 mm [Table 2].

FACTORS ASSOCIATED WITH COMMUNITY PERIODONTAL INDEX OF TREATMENT NEEDS
At the bivariate level, three background and four behavioral factors were associated with CPITN severity (P < 0.05) [Table 3]. The relationship of the primary caretaker to the disabled individual and their level of education were not significantly associated with CPITN (P = 0.31 and 0.940, respectively). Mean CPITN scores were statistically significantly larger in adults (P < 0.001); males (P = 0.045) and in those residing in the area of Mount Lebanon (P < 0.001). Among the behavioral factors recorded, the availability of a toothbrush (P = 0.004), brushing frequency (P = 0.007), type of meals consumed (P = 0.001), and sweet consumption between meals (P < 0.001) were significantly associated with CPITN score. Regarding the oral hygiene, higher scores were recorded for subjects not having a toothbrush (2.23 ± 0.30 compared to 1.34 ± 1.07) and for those who do not brush their teeth (2.17 ± 1.15) while the lowest CPITN scores were noted in those who brush at least 2/day with or without help (1.10 ± 1.10 and 1.15 ± 1.08, respectively) [Table 3]. In addition, individuals who consumed predominantly home-cooked meals had lower CPITN scores than those mainly consuming fast food and pastries (1.09 ± 0.99 compared to 2.33 ± 0.82) and those consuming sweets between meals more than 2/day had the highest CPITN scores (1.85 ± 0.16) compared to all other levels of sweet consumption (1.06 ± 1.10–1.29 ± 1.11).

A combination of 8 background and behavioral characteristics significantly explained CPITN score in the final multivariate model (F(19,252) =5.58, P < 0.001; R² =0.2963) [Table 4]. Among these eight variables, only four were significantly associated with

![Table 2: Percentage distribution of examined institutionalized physically challenged persons by periodontal health and treatment needs (n=272)](image)

| Variable | Age (years), n (%) | Total, n (%) |
|----------|-------------------|--------------|
| CPITN    |                   |              |
| Healthy  | 47 (30.9)         | 71 (26.1)    |
| Bleeding on probing | 52 (34.2) | 76 (27.9) |
| Supra-/sub-gingival calculus | 42 (27.6) | 85 (31.3) |
| Pocket(s) of 4-5 mm | 11 (7.2) | 30 (11.0) |
| Pocket(s) of ≥6 mm | 0 | 10 (3.7) |
| Periodontal TN |                   |              |
| TN0 | 47 (30.9) | 71 (26.1) |
| TN1 | 52 (34.2) | 76 (27.9) |
| TN2 | 53 (34.9) | 115 (42.3) |
| TN3 | 0 | 10 (3.7) |

CPITN=Community periodontal index of treatment needs, TN=Treatment need

| Table 1: Periodontal status (community periodontal index of treatment needs) and assessment of treatment needs |
|-----------------------------------------------------------|
| Periodontal status | CPITN score | TN code | TNS |
|---------------------|-------------|---------|-----|
| Healthy             | 0           | 0       | No periodontal TNs |
| Bleeding on probing | 1           | 1       | Oral hygiene improvement |
| Supragingival or subgingival calculus | 2 | 2 | Calculus removal and oral hygiene improvement |
| Pocket(s) (mm)      |             |         |     |
| 4 or 5              | 3           | 2       | Calculus removal and oral hygiene improvement |
| >6                  | 4           | 3       | Complex periodontal care and oral hygiene improvement |

CPITN=Community periodontal index of treatment needs, TNS=Treatment needs
Table 3: Bivariate associations between selected background and disabled characteristics and community periodontal index of treatment needs score (n=272)

| Associated characteristics (P<0.2) | CPITN score | df, rdf | F-statistic | P* |
|-----------------------------------|-------------|---------|-------------|----|
| Age (years)                        |             |         |             |    |
| 15                                | 152         | 1.11±0.93 | 1, 270      | 22.61 | <0.001** |
| 35-44                             | 120         | 1.72±1.19 |             |      |          |
| Sex                               |             |         |             |    |
| Males                             | 141         | 1.51±1.12 | 1, 270      | 4.05 | 0.045*   |
| Females                           | 131         | 1.24±1.06 |             |      |          |
| Governorate                       |             |         |             |    |
| South                             | 19          | 0.63±0.68 | 4, 267      | 7.58 | <0.001** |
| North                             | 57          | 0.96±1.08 |             |      |          |
| Beirut                            | 8           | 1.63±0.92 |             |      |          |
| Mount Lebanon                     | 144         | 1.67±1.07 |             |      |          |
| Bekaa                             | 44          | 1.27±1.06 |             |      |          |
| Type of arrangement               |             |         |             |    |
| Full-time                         | 46          | 1.61±1.22 | 1, 270      | 2.37 | 0.125    |
| Part-time                         | 226         | 1.34±1.07 |             |      |          |
| Degree of physically challenged   |             |         |             |    |
| Mild                              | 171         | 1.26±1.07 | 2, 269      | 2.75 | 0.066    |
| Moderate                          | 94          | 1.59±1.11 |             |      |          |
| Severe                            | 7           | 1.57±1.40 |             |      |          |
| Availability of toothbrush        |             |         |             |    |
| Yes                               | 259         | 1.34±1.07 | 1, 270      | 8.39 | 0.004**  |
| No                                | 13          | 2.23±1.30 |             |      |          |
| Frequency of brushing             |             |         |             |    |
| No toothbrush use                 | 18          | 2.17±1.15 | 5, 266      | 3.25 | 0.007**  |
| Rarely                            | 31          | 1.39±0.99 |             |      |          |
| 1/day with help                   | 15          | 1.60±1.21 |             |      |          |
| 1/day without help                | 80          | 1.54±1.07 |             |      |          |
| ≥2/day with help                  | 10          | 1.10±1.10 |             |      |          |
| ≥2/day without help               | 118         | 1.15±1.08 |             |      |          |
| Type of meals consumed            |             |         |             |    |
| Home-cooked meals                 | 97          | 1.09±0.99 | 2, 269      | 7.18 | 0.001**  |
| Fast food and pastries            | 6           | 2.33±0.82 |             |      |          |
| Combination of both               | 169         | 1.51±1.12 |             |      |          |
| Sweets between meals              |             |         |             |    |
| No consumption                    | 60          | 1.18±1.00 | 4, 267      | 7.13 | <0.001** |
| Rarely                            | 7           | 1.29±1.11 |             |      |          |
| 1/day                             | 50          | 1.16±1.02 |             |      |          |
| 2/day                             | 62          | 1.06±1.10 |             |      |          |
| >2/day                            | 93          | 1.85±1.06 |             |      |          |

Table presents only variables associated with CPITN at P<0.2 and that were included in subsequent multivariate analysis. *P value for entire model reported (P>F), **Statistically significant at P<0.05, ***Statistically significant at P<0.01. df=Degrees of freedom, rdf=Residual degrees of freedom, CPITN=Community periodontal index of treatment needs, SD=Standard deviation.

CPITN score while controlling for the remaining factors: age, governorate, type of meals consumed, and sweet consumption between meals (P < 0.05). Controlling for the remaining variables, the CPITN score in adults is larger by a mean of 0.49 compared to 15-year-old (95% CI: 0.22–0.75; P < 0.001). Individuals residing in Mount Lebanon and Bekaa also have more severe CPITN scores than those residing in the South (P = 0.001 and 0.026, respectively), while no differences were noted between those in Beirut and the North compared to the South (P = 0.06 and 0.405, respectively). Accounting for the effect of the remaining variables, the frequency of tooth brushing is not significantly associated with CPITN score. The latter is rather explained by consuming fast food and pastries instead of home-cooked meals (P = 0.045) and increased sweet consumption between meals, but only when more than 2/day compared to no consumption at all (P = 0.004).
Table 4: Multivariate analysis showing associations between selected variables and community periodontal index of treatment needs, score (n=272)

| Associated variables                  | CPITN        |
|---------------------------------------|--------------|
|                                       | Regression coefficient | SE | 95% CI          | P    |
| Constant                              | 0.49         | 0.38 | -0.26-1.25     | 0.198|
| Age (15)                              |              |     |                 |
| 35–44                                 | 0.49         | 0.13 | 0.22-0.75       | <0.001**|
| Sex (males)                           |              |     |                 |
| Females                               | -0.21        | 0.12 | -0.45-0.02      | 0.073|
| Governorate (South)                   |              |     |                 |
| North                                 | 0.23         | 0.28 | -0.31-0.78      | 0.405|
| Beirut                                | 0.84         | 0.44 | -0.03-1.71      | 0.060|
| Mount Lebanon                         | 0.87         | 0.25 | 0.38-1.37       | 0.001**|
| Bekaa                                 | 0.63         | 0.28 | 0.07-1.18       | 0.026*|
| Degree of physically challenged (mild)|              |     |                 |
| Moderate                              | 0.16         | 0.13 | -0.11-0.42      | 0.240|
| Severe                                | 0.17         | 0.38 | -0.57-0.92      | 0.645|
| Frequency of brushing (no use)        |              |     |                 |
| Rarely                                | -0.31        | 0.30 | -0.91-0.28      | 0.296|
| 1/day with help                       | -0.12        | 0.34 | -0.79-0.55      | 0.722|
| 1/day without help                    | -0.16        | 0.26 | -0.67-0.35      | 0.544|
| ≥2/day with help                      | -0.45        | 0.39 | -1.22-0.32      | 0.255|
| ≥2/day without help                   | -0.41        | 0.26 | -0.92-0.10      | 0.118|
| Type of meals consumed (home-cooked)  |              |     |                 |
| Fast food and pastries                | 0.86         | 0.43 | 0.02-1.70       | 0.045*|
| Combination of both                   | 0.17         | 0.16 | -0.13-0.48      | 0.268|
| Sweets between meals (no consumption) |              |     |                 |
| Rarely                                | 0.07         | 0.39 | -0.70-0.84      | 0.864|
| 1/day                                 | 0.21         | 0.20 | -0.18-0.61      | 0.287|
| 2/day                                 | 0.00         | 0.19 | -0.37-0.38      | 0.987|
| >2/day                                | 0.57         | 0.19 | 0.18-0.95       | 0.004**|
| F (19, 252)                           | 5.58         |     |                 |
| P > F                                 | <0.001**     |     |                 |
| $R^2$                                 | 0.2963       |     |                 |
| Adjusted $R^2$                        | 0.2432       |     |                 |
| RMSE                                  | 0.9545       |     |                 |

$F$ (x, y) refers to $F$-statistic, the model’s degrees of freedom and residual degrees of freedom. Base=Refers to the base outcome all other categories are compared to *Statistically significant at $P$$\leq$0.05, **Statistically significant at $P$$<0.01$. Age recorded in years. SE=Standard error, RMSE=Root-mean-square-error, CPITN=Community periodontal index of treatment needs, CI=Confidence interval.

**Periodontal treatment needs**

A large proportion of the subjects examined required periodontal treatment. The most prevalent treatment need was plaque control and scaling (TN2), followed by oral hygiene instruction (TN1). The need for complex periodontal treatment (TN3) was required by only a small percentage of the overall examined sample (3.7%).

The majority of adolescents aged 15 were almost equally divided between those requiring oral hygiene instruction only and those additionally requiring scaling (34.2% and 34.9%, respectively), and only about 31% required no treatment. At age 35–44, however, more than half required oral hygiene instruction and scaling and slightly <10% additionally were in need for complex periodontal treatment [Table 2].

**Discussion**

The findings of this study represent the first report evaluating the periodontal health and the treatment needs of institutionalized intellectually disabled individuals in Lebanon; it showed that only around one-quarter had healthy periodontal status and bleeding and calculus stood out as the predominant condition, affecting more than 50% of the sample. In addition to oral hygiene instruction, more than 40% were in need of professional prophylaxis including calculus removal and scaling/root planning. Higher CPITN scores were associated with the adult than the adolescent sample, and increasing age was a significant predictor of CPITN score severity when all other background and behavioral factors were taken into account. This general increase in CPITN scores or
in other indicators of periodontitis with increasing age has been similarly reported in earlier investigations\(^{16-19}\) and may be due to the cumulative effects of calculus and the progressive nature of periodontal disease and the cumulative effects of periodontal breakdown over time.\(^{20}\) Our results also support previous assessments of intellectual disabled populations reporting low prevalence of healthy periodontium and the predominance of bleeding and calculus.\(^{9,17,21-23}\) Comparison to other populations in the region is limited owing to the extreme scarcity of similar research, but the limited data available on children/adolescents supports our findings in 15-year-old children. In children with Down’s syndrome in the United Arab Emirates, only 10% had a healthy periodontium, around one-quarter require comprehensive prophylaxis including scaling and root planing while around 50% required additional complex periodontal treatment.\(^{24}\) In another assessment of institutionalized mentally retarded children in Iran, <1% exhibited healthy periodontal tissue, but treatment needs were slightly less severe: three-quarters required only oral hygiene instructions, slightly less than a quarter required scaling and slightly over 1% were in need for complex periodontal treatment.\(^{16}\)

Despite the importance of mechanical plaque removal to maintain a healthy periodontium and the intuitive belief that intellectual disability is associated with limitations in manual dexterity limiting proper tooth brushing,\(^{25}\) the frequency of tooth brushing (with or without help) was not a significantly contributor to CPITN score severity when controlling for other background and behavioral factors. Although several studies do report limitations in manual dexterity in the intellectually disabled,\(^{26-28}\) this has not directly been linked to poor oral health outcomes such as periodontal disease.

Shaw et al.,\(^{29}\) who assessed manual dexterity in their study, similarly showed that, although periodontal health was poor, it was not correlated with manual dexterity. A possible explanation may be that, given the age of the examined subjects (15-year-old and 35–44-year-old) and in light of the already established presence of supra- and sub-gingival calculus, the severity of CPITN score may be set and cannot be reversed in the absence of actual mechanical removal of the irritating deposits. It must be emphasized that although data were collected on current tooth brushing practices, it is a history of oral hygiene practices and tooth brushing habits that more closely explain the periodontal conditions recorded on the day of clinical examination. It must also be considered that the frequency of brushing may not necessarily correlate with the efficiency of brushing and may not have been truly reflective of the oral hygiene status of the examined individual. Rather than brushing frequency, the significant predictors of CPITN score severity in our sample were the consumption of both predominantly carbohydrate rich meals (fast food) and sweets between meals more than twice a day. These results highlight the importance of dietary, behavioral factors in the maintenance of periodontal health, at least in conjunction with oral hygiene measures but perhaps even more importantly than the frequency of brushing in such vulnerable populations as the intellectual disabled. The prolonged retention of food particles in the oral cavity due to a lack of normal masticatory functions in intellectual disabled persons may result in increased gingival inflammation and eventually lead to bleeding and to periodontal disease. Owing to the difficulties in the provision of oral health instruction in a disabled population, the removal of sub- and supra-gingival calculus would facilitate the limited self-performed oral hygiene that may be taking place. Therefore, in addition to controlling carbohydrate intake, frequent oral prophylaxis, and calculus removal is crucial.

Previous studies have highlighted the importance of SES as a predictor of oral and periodontal health in intellectual disabled individuals, including variables such as parent education, geographical location, lack of organizational support, and overall SES category.\(^{7,17,30,31}\) Our results highlight that the periodontal health of the institutionalized intellectual disabled individuals in Lebanon is also subject to significant socioeconomic inequalities regardless of all other background and behavioral characteristics assessed. Individuals who were cared for in institutions located in Mount Lebanon and Bekaa were likely to have significantly higher CPITN scores than those in all remaining governorates, those in Mount Lebanon in particular being the most vulnerable. The geographical location in our sample is likely to be a proxy variable for underlying socioeconomic disadvantages that may include parental education, financial stability, and inaccessibility to dental services, but nonetheless highlight the inequality in the distribution of periodontal disease even among the intellectual disabled population which is likely to already be suffering from greater unattended dental treatment needs in comparison to the general population.\(^{32}\)

Although our results cannot be extrapolated to the general population of noninstitutionalized intellectually disabled individuals in Lebanon, several factors contribute to the importance of our study to the data on periodontal health in intellectual disabled individuals in Lebanon. The exhaustive survey that was conducted attempted to include all registered institutionalized intellectual disabled persons in Lebanon to produce data and conclusions
that are externally valid and representative of the entire institutionalized population of interest. The use of the simple and straightforward CPITN index, in addition to the examination of an easily accessible population, offers the possibility of preliminary goal-setting using limited resources until more comprehensive research sheds light on the broader population of institutionalized intellectually disabled individuals. The description of the treatment needs of this institutionalized population presents the opportunity for cost-effective prevention and intervention by various governmental and nongovernmental stakeholders responsible for the improvement of the oral health of the Lebanese population. Such programs must integrate the provision of treatment for existing disease with prevention of future disease by increasing the awareness of parents and institution caregivers regarding the importance of not only oral hygiene but also dietary behavioral factors in maintaining periodontal health.

Further prospective studies are needed to validate the results of this study on the determinants of periodontal disease in the intellectually disabled population and to establish cause-and-effect relationships. On the other hand, larger cross-sectional epidemiological studies not limited to the institutionalized population are needed to shed light on the oral health status of the entire intellectual disabled population in Lebanon so that appropriate prevention and intervention programs may then be tailored.

**Conclusion**

The majority of institutionalized intellectual disabled adolescents and adults in Lebanon are in need for periodontal treatment. Poor periodontal conditions are further aggravated by social inequalities between geographical locations. The significant contributions of dietary, behavioral factors emphasize the importance of implementing awareness and behavioral changes as part of prevention and treatment programs.

**Acknowledgments**

We would like to thank the Lebanese MSA and all the contributors’ institutions for their kind help and cooperation.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

**References**

1. Braddock DE. Disability at the Dawn of the 21st Century and the State of the States. USA: American Association on Mental Retardation; 2002.
2. Cooper SA, Smiley E, Morrison J, Williamson A, Allan L. Mental ill-health in adults with intellectual disabilities: Prevalence and associated factors. Br J Psychiatry 2007;190:27-35.
3. Gomes MC, Pinto-Sarmento TC, Costa EM, Martins CC, Granville-Garcia AF, Paiva SM. Impact of oral health conditions on the quality of life of preschool children and their families: A cross-sectional study. Health Qual Life Outcomes 2014;12:55.
4. Khan SA, Kong EF, Meiller TF, Jabra-Rizk MA. Periodontal diseases: Bug induced, host promoted. PLoS Pathog 2015;11:e1004952.
5. Linehan C, Walsh PN, van Schrojenstein Lantman-de Valk HJM, Kerr M. POMONA II Grant: Health Indicators for people with Intellectual Disability using an indicator set. Final Report 2009. Available from: http://www.pomonaproject.org/action1_2004_frep_14_en.pdf. [Last accessed on 2015 Jul 08].
6. Diab HA, Hamadeh GN, Ayoub F. A survey of oral health in institutionalized population with intellectual disabilities: Comparison with a national oral health survey of the normal population. J Int Soc Prev Community Dent 2017;7:141-7.
7. Anderson LL, Humphries K, McDermott S, Marks B, Sisirak J, Larson S. The state of the science of health and wellness for adults with intellectual and developmental disabilities. Intell Dev Disabil 2013;51:385-98.
8. Diab HA, Salameh Z, Hamadeh GN, Younes G, Ayoub F. Oral health status of institutionalized individuals with intellectual disabilities in Lebanon. J Oral Maxillofac Res 2017;8:64.
9. Jain M, Bharadwaj SP, Kaira LS, Bharadwaj SP, Chopra D, Prabu D, et al. Oral health status and treatment need among institutionalised hearing-impaired and blind children and young adults in Udaipur, India. A comparative study. Oral Health Dent Manag 2013;12:41-9.
10. Lin LP, Lin JD. Perspectives on intellectual disability in Taiwan: Epidemiology, policy and services for children and adults. Curr Opin Psychiatry 2011;24:413-8.
11. Page RC, Morrison EC. Summary of outcomes and recommendations of the workshop on (CPITN). Int Dent J 1994;44 5 Suppl 1:589-94.
12. Pilot T, Miyazaki H. Global results: 15 years of CPITN epidemiology. Int Dent J 1994;44 5 Suppl 1:553-60.
13. Hughes MJ, Gazmarranian JA. The relationship between income and oral health among people with intellectual disabilities: A global perspective. Spec Care Dentist 2015;35:229-35.
14. Lebanese Ministry of Social Affairs, Unofficial Report of the Distribution of Handicapped Individuals in Lebanon by Governmentate, Age and Type of Handicap; 31 January, 2015.
15. Aïnano J, Barnes D, Beagrie G, Cutress T, Martin J, Sardo-Infirri J. Development of the World Health Organization (WHO) community periodontal index of treatment needs (CPITN). Int Dent J 1982;32:281-91.
16. Nematollahi H, Makarem A, Noghani A. Periodontal treatment needs amongst 9-14 year-old institutionalized mentally retarded children in Mashhad, Iran. J Dent (Shiraz) 2010;10:15-20.
17. Kadam NS, Patil R, Gurav AN, Patil Y, Shete A, Tari RN, et al. Oral Hygiene Status, Periodontal Status, and Periodontal Treatment Needs among Institutionalized Intellectually Disabled Subjects in Kolhapur District, Maharashtra, India. Journal of Oral Diseases 2014. Article ID 535316. doi:10.1155/2014/535316.
18. Aimetti M, Perotto S, Castiglione A, Mariani GM, Ferrarotti F, Romano F. Prevalence of periodontitis in an adult population from an urban area in North Italy: Findings from a cross-sectional population-based epidemiological survey. J Clin Periodontol 2015;42:622-31.
19. Ramsay SE, Whincup PH, Watt RG, Tsakos G, Papacosta AO, Lennon LT, et al. Burden of poor oral health in older age: Findings from a population-based study of older British men. BMJ Open 2015;5:e009476.

20. Borrell LN, Papapanou PN. Analytical epidemiology of periodontitis. J Clin Periodontol 2005;32 Suppl 6:132-58.

21. Siddibhavi MB. Oral health status of handicapped children attending various special schools in Belgaum city, Karnataka. Webmedcentral Epidemiology 2012;3:WMC003061.

22. Rahul VK, Mathew C, Jose S, Thomas G, Noushad MC, Feroz TP. Oral manifestation in mentally challenged children. J Int Oral Health 2015;7:37-41.

23. Popoola BO, Dosumu EB, Ifesanya JU. Periodontal status and treatment need among adolescents in Ibadan, Southwestern Nigeria. Braz J Oral Sci 2015;14:117-21.

24. Jaber MA. Oral health condition and treatment needs of a group of UAE children with Down syndrome. Ibnosina J Med Biomed Sci 2010;2:62-71.

25. Teixeira SA, Mendes Santos PC, Batista AR, Albuquerque BN, Vasconcelosa M, Borges-Oliveira AC. Assessment of oral hygiene in mentally disabled children. Rev Odonto Ciênc 2015;30:65-70.

26. Leonard S, Msall M, Bower C, Tremont M, Leonard H. Functional status of school-aged children with Down syndrome. J Paediatr Child Health 2002;38:160-5.

27. Carmeli E, Kessel S, Bar-Chad S, Merrick J. A comparison between older persons with Down syndrome and a control group: Clinical characteristics, functional status and sensorimotor function. Downs Syndr Res Pract 2004;9:17-24.

28. Dolva AS, Coster W, Lilja M. Functional performance in children with Down syndrome. Am J Occup Ther 2004;58:621-9.

29. Shaw L, Shaw MJ, Foster TD. Correlation of manual dexterity and comprehension with oral hygiene and periodontal status in mentally handicapped adults. Community Dent Oral Epidemiol 1989;17:187-9.

30. Sanders C, Kleinert HL, Boyd SE, Herren C, Theiss L, Mink J. Virtual patient instruction for dental students: Can it improve dental care access for persons with special needs? Spec Care Dentist 2008;28:205-13.

31. Waldman HB, Fenton SJ, Perlman SP, Cinotti DA. Preparing dental graduates to provide care to individuals with special needs. J Dent Educ 2005;69:249-54.

32. Oliveira JS, Prado Júnior RR, de Sousa Lima KR, de Oliveira Amaral H, Moita Neto JM, Mendes RF. Intellectual disability and impact on oral health: A paired study. Spec Care Dentist 2013;33:262-8.