

Objective and Subjective Oral Health and Quality of Life of Migrant Farm Workers in the U.S.A.

Irma Gavaldon¹, Robert A. Bagramian², Marita Rohr Inglehart³

¹ D.D.S. Dentist in private practice in Ann Arbor, Michigan, U.S.A. ² D.D.S., Dr.P.H. Professor of Dentistry, Department of Periodontics and Oral Medicine, School of Dentistry, University of Michigan, Ann Arbor, Michigan, U.S.A. ³ Dr. Phil. Habil. Associate Professor, Department of Periodontics and Oral Medicine, School of Dentistry and Adjunct Associate Professor, Department of Psychology, College of Literature, Science and Arts, University of Michigan, Ann Arbor, Michigan, U.S.A.

Abstract

In 2008, more than one million hired farm workers were employed in the U.S.A. These farm workers constituted a third of the total U.S. agricultural workforce. Prior research showed that the majority of these migrant workers had oral health problems, without having access to oral health care services. **Objectives:** To explore the relationship between migrant farm workers' objective and subjective oral health and their oral health-related quality of life (OHRQoL). **Methods:** Data were collected from a convenience sample of 120 migrant workers (average age: 37.58 years; age range: 18 to 65 years; 51.2% male/48.8% female; 96% Hispanic) during oral examinations and face-to-face interviews conducted in Spanish in migrant worker camps in Northern Michigan. **Results:** 19% of the respondents had dental abscesses, 71.9% had untreated caries, and 43.8% had lost teeth because of caries. Nevertheless, only 21.7% described their oral health as poor (average subjective oral health rated on a five-point scale, with 1 = "poor oral health": 2.42). However, 98.3% rated the importance of good dental health as high. The respondents' general, psychological and social indices of OHRQoL were significantly correlated with objective and subjective oral health indicators and oral health-related behaviour. **Conclusions:** A substantial percentage of migrant workers have impaired oral health. Despite objective indicators of poor oral health, the migrant workers' self-perceived oral health was not as negative as might have been expected. However, OHRQoL assessments showed the ways in which their quality of life was impaired by their oral health status.

Key Words: Oral Health, Caries, Self-Perceptions, Oral Health-Related Quality of Life, Gender, Migrant Workers, Self-Perceived Oral Health, Dental Abscesses

Introduction

In 2008, the U.S. Department of Agriculture reported that approximately three million workers in the U.S.A. were employed in agricultural production and that approximately one million of those were farm workers [1]. The majority of these farm workers were foreign born (National Agricultural Workers Survey, 2000), with 77% born in Mexico, 2% in other Latin American countries, and 5% in non-American countries [2]. The farm economy depends on the migrant workers who follow the crops, or travel back and forth from home bases in Florida, Texas, California, and Michigan [3]. Their employment is usually of short duration and requires frequent moves, making it difficult for them to access public services, such as health care services provided in community health centres.

This lack of access to health care services can have serious consequences for these workers, especially because they face workplace hazards [4]. For example, most of the perishable food that the migrant and seasonal workers pick is treated with chemicals that pose occupational and environmental health risks for the workers [5,6]. In addition, farm work is graded as the most dangerous occupation in the U.S. For example, the percentages of heat-related deaths for crop workers is approximately 0.39 per 100,000 migrant workers compared with 0.02 for the U.S. civilian workforce as a whole [7,8]. Migrant workers not only have the highest rate of toxic chemical injuries because of their constant exposure to pesticides and other chemical poisons, but they are also frequently diagnosed with respiratory disease, parasitic conditions,

Corresponding author: Marita Rohr Inglehart, Department of Periodontics and Oral Medicine, School of Dentistry, University of Michigan, Ann Arbor, Michigan. 48109-1078, USA; e-mail: mri@umich.edu

lower weight, vitamin A deficiency, skin infection, and chronic diarrhoea. The rates of these health problems among migrant workers are similar to those of citizens in Third World countries [9-11]. This situation is aggravated by the fact that only 5% of farm workers reported being covered by employer-provided health insurance [12], and that 75% are uninsured [2].

Concerning the migrant workers' oral health and oral health care use, research has shown that 50% of migrant workers did not seek oral health care on a regular basis [13,14], compared to 65% of the U.S. population who use oral health care services in a given year such as 1999 [15]. Quandt *et al.* (2007) reported that 60% of adult migrant workers between 20 and 64 years of age had at least one dental visit between 1999 and 2004 [16]. Reasons why migrant workers do not seek oral health care include financial and transportation problems, language, educational and cultural barriers, and undocumented immigrant status [13,17]. Considering that 61% of migrant workers had incomes below the poverty line with a median income of about \$7500 per year in 2000 [2], that 52% lack a proper work visa [18], that only 44% of farm workers own a vehicle [2], and that only 5% of Latin American migrant workers reported that they speak English fluently [18], it might even be surprising that the percentages of dental visits were as high as reported. In any case, these background characteristics undoubtedly contributed to the finding that 22% of farm workers had never seen a dentist [14].

Based on these considerations, it is not surprising that oral health problems are ranked as one of the major health problems among migrant workers [16]. Research has shown that more than two-thirds of migrant workers had at least one oral health problem such as untreated caries, periodontal disease, and missing and broken teeth [14,18].

Although this previous research has convincingly shown that a majority of migrant workers had oral health problems, research on their oral health-related quality of life (OHRQoL) [19] has been so far limited to only one study. Quandt *et al.* (2007) conducted a study with 151 migrant and seasonal farm workers in North Carolina and found that these workers' self-reported oral health problems—such as their reported caries and reported number of missing teeth—were high and were significantly correlated with poorer OHRQoL, especially with pain and discomfort. However, these authors did

not have any objective oral health data. It seems therefore worthwhile to explore the relationship between the migrant workers' objectively assessed oral health status, their subjectively assessed/self-perceived oral health, and their OHRQoL.

Aims

The aims of this study were to explore the relationships between objectively assessed oral health, self-perceived oral health, and OHRQoL.

Methods

This study was approved by the Institutional Review Board (I.R.B.) for the Health Sciences at the University of Michigan (#HUM00021382).

Participants

Data were collected from a convenience sample of 120 migrant workers during oral examinations in a temporary dental clinic and during face-to-face interviews in migrant worker camps in Northern Michigan. The workers ranged in age from 18 to 65 years (average age: 37.58 years) and were mostly Hispanic (96%). Approximately equal numbers of male (51.2%) and female workers (48.8%) were included in the study.

Procedure

This study was part of an outreach project by fourth-year dental student volunteers and their instructor from the University of Michigan School of Dentistry for migrant workers in and around Traverse City, Michigan. Portable dental equipment was set up in a community health clinic for four weeks. When adult patients came to the community health clinic because of general health problems, they were informed that the clinic was offering free dental services for a four-week limited time period. In addition, the first author of this manuscript was interested in conducting the research described in this paper. She therefore visited the migrant worker camps and informed the workers about the study and that they could have free dental examinations and dental services during this four-week period. When the migrant workers agreed to participate in the research, they signed a consent form and a Health Insurance Portability and Accountability Act form (HIPAA). Once they had given written consent, standardised oral health screening examinations were performed by the first author before the actual treatment began. For 24 participants, these examinations were performed at the campsite because they were not interested in

receiving dental care and coming to the temporary dental clinic. For 96 participants, the examinations were performed at the temporary dental clinic. Radiographs were only taken from the 96 respondents who came to the dental clinic. The first author of this study, who is a native Spanish speaker, also conducted all face-to-face interviews in Spanish, mostly at the campsites. The dental students provided the necessary dental care under the supervision of the first author.

Materials

Oral health indicators were collected during the oral examinations. Specifically, the examiner noted the number of missing teeth in general and in the front, the number of extracted teeth and of teeth missing due to caries or due to other reasons. The number of abscesses and decayed teeth was assessed clinically. Those 96 migrant workers who came to the dental clinic also had radiographs taken. The clinical assessment of caries was determined without the use of a dental explorer (probe). Only obvious cavitated lesions were classified as caries. Incipient lesions were not assessed as caries lesions. Gingival health was assessed in a general fashion as being either good, fair, or poor. This categorisation is based on the instructions that gingival health is good when the appearance of the gingiva is firm and pink and has no inflammation. A categorisation of fair would be an assessment of the gingiva as being pink-coloured but with slight areas of inflammation. Poor gingival health is presented when the patient has red-coloured gingiva and obvious inflammation. A plaque score was determined by counting the number of teeth with visible plaque and calculus, and determining the percentage of these teeth based on all teeth present. In addition, the numbers of restored teeth and of crowns were also recorded.

The respondents' self-perceptions of their oral health were assessed with one item. The respondents indicated on a five-point scale, from 1 = "poor" to 5 = "excellent", as to how they perceived their own oral health. In addition, they also indicated the self-perceived dryness of their mouths on the same scale.

The migrant workers' OHRQoL was assessed with the Michigan Oral Health-Related Quality of Life Scale—Adult Version (MOHRQoL—A) [20]. This scale consists of 15 Likert-style questions with five-point answer scales ranging from 1 = "disagree strongly" to 5 = "agree strongly". The wording of

these statements is included in *Table 1*. A factor analysis (extraction method: principal component analysis; rotation method: varimax) confirmed that these items loaded on three factors. The items loading on each of these three factors were used to compute three indices by averaging the answers to the items loading on these factors respectively. The first index assesses general OHRQoL (six items; Cronbach's alpha = 0.86); the second factor measures psychological aspects of the workers' OHRQoL (five items; Cronbach's alpha = 0.90), and the third factor assesses the social aspects of the workers' OHRQoL (four items; Cronbach's alpha = 0.92).

Statistical analyses

The data were analysed with statistical software (SPSS version 16.0; SPSS Inc, Chicago, U.S.A.). Descriptive statistics were used to provide an overview of the respondents' objective and subjective oral health indicators and their OHRQoL responses. Pearson correlation coefficients were used to explore the relationships between the objective and subjective oral health indicators and the OHRQoL responses.

Results

The first step in the analyses was to determine the migrant workers' objectively assessed and subjectively reported oral health. As can be seen in *Table 2*, large percentages of migrant workers had dental decay (clinically assessed decay: $n=83/69\%$; radiographically diagnosed decay: $n=46/38\%$). A total of 21% ($n=26$) of the respondents had clinically diagnosed abscesses and 31% ($n=37$) were diagnosed with abscesses based on radiographs. In addition, 53% ($n=62$) had extracted teeth, with 48% ($n=58$) reported as missing teeth due to caries and 42% ($n=50$) reported as due to other reasons. Only 32% ($n=38$) of the migrant workers had good gingival health, whereas 44% ($n=52$) had fair gingival health, and 25% ($n=30$) had poor gingival health. A total of 75% ($n=90$) of the workers reported that they had not seen a dentist during the past year.

Only 38% ($n=46$) of the migrant workers had visible plaque present on less than 20% of their teeth, whereas 62% ($n=74$) had plaque or calculus on more than 20% of their teeth. In connection with these poor plaque scores, it should be mentioned that 10% ($n=12$) of the migrant workers reported that they never brushed their teeth and 33% ($n=40$) that they brushed less than once a day, whereas only 38% ($n=46$) brushed once per day and 18%

Table 1. Overview of the Responses to the Oral Health-Related Quality of Life Items

General OHRQoL: My teeth and gums	1	2	3	4	5	Mean SD
- a. limit the kinds or amounts of food I eat.	54%	13%	23%	4%	6%	1.95 1.218
- b. cause discomfort.	51%	20%	18%	6%	6%	1.97 1.212
- c. cause a lot of worry and concern.	64%	10%	13%	10%	3%	1.80 1.210
- h. make me concerned about the way I look.	51%	12%	12%	13%	13%	2.25 1.496
- l. have a bad effect on taste and food.	69%	20%	6%	3%	3%	1.50 0.910
- o. If you would spend the rest of your life with your teeth and gums as they are right now, how would you feel about it?*	12%	16%	33%	20%	19%	3.19 1.257
Psychological OHRQoL: My teeth and gums						
- i. keep me from enjoying life.	78%	12%	5%	2%	3%	1.41 0.930
- j. interfere with my daily activities.	83%	9%	5%	0.9%	3%	1.32 0.827
- k. interfere with my intimate relationship.	85%	8%	4%	3%	0%	1.29 0.837
- m. reduce my general happiness with life.	88%	8%	1%	2%	2%	1.22 0.703
- n. affect my life in all of its aspects.	90%	8%	2%	0%	0%	1.12 0.377
Social OHRQoL: My teeth and gums						
- d. keep me for socialising/going out.	73%	6%	6%	9%	6%	1.69 1.271
- e. make me uncomfortable when eating in front . of others	62%	11%	8%	10%	9%	1.94 1.398
- f. make me uncomfortable when speaking in front . of others	57%	11%	10%	13%	9%	2.07 1.425
- g. make me nervous.	71%	12%	8%	6%	3%	1.59 1.084

* The answers to this question were given on a five-point scale with 1 = terrible, 2 = mostly dissatisfied, 3 = mixed, 4 = mostly delighted, and 5 = satisfied

(n=22) reported brushing twice per day. In addition, 53% (n=64) never flossed, 21% (n=24) flossed rarely, and 17% (n=20) less than every day, whereas only 8% (n=10) of the respondents reported flossing daily and 2% (n=2) more than once a day.

In addition to assessing the migrant workers' oral health objectively in oral health screening examinations, oral health was also determined subjectively with the question "How would you describe the health of your teeth and gums?". The

answers to this question were given on a five-point answer scale from 1 = "poor" to 5 = "excellent". Table 2 shows that only 22% (n=26) of the migrant workers described their oral health as "poor", whereas 60% (n=72) described it as either "fair" or "good", and 18% (n=22) as "very good" or "excellent". A second question asked about the migrant workers' self-perceived dryness of their mouths. This question was formulated as "Think about how dry your mouth usually feels. On a scale from 1 = 'Much too little saliva' to 5 = 'Perfect amount of

Table 2. Overview of the Objective and Subjective Oral Health Indicators

Objective oral health indicators	No/0	Yes/1 and >	Mean	SD/range
Sum of teeth in front of the mouth	8%	92%	11.46	1.48/4 to 12
Abscesses:				
- clinical	79%	21%	0.33	0.82/0 to 6
- radiographic	69%	31%	0.57	1.229/0 to 8
Decayed teeth:				
- clinical	31%	69%	2.67	3.42/0 to 21
- radiographic	62%	38%	1.45	3.183/0 to 24
Restored teeth/crowns	55%	45%	1.89	2.93/0 to 14
Extracted teeth	47%	53%	2.47	3.72/0 to 16
Missing teeth due to caries	52%	48%	2.27	3.72/0 to 16
Missing teeth due to other reasons	58%	42%	1.01	1.62/0 to 8
Plaque score (%)	< 21%: 38%	>20%: 62%	40.13	29.01/0 to 95
Gingival health*	Good: 32%	Fair: 44%/ Poor: 25%	1.93	0.75/0 to 2
Subjective oral health indicators	1	2 & 3	4 & 5	Mean SD/range
Self perceived oral health**	22%	60%	18%	2.42 1.15/1 to 5
Self perceived dryness of mouth***	0%	23%	77%	4.18 1.20/1 to 5
How important is your oral health?	0%	2%	98%	0.4.93 31/3 to 5

* Gingival health was measured with the categories: 1 = good, 2 = fair, 3 = poor.

** Self-perceived oral health was measured with the question "How would you describe the health of your teeth and gums?". The answer categories ranged from 1 = poor to 5 = excellent.

*** Self-perceived dryness of mouth was measured with the question "Think about how dry your mouth usually feels. On a scale from 1 = 'much too little saliva' to 5 = 'perfect amount of saliva', how much saliva do you have?"

saliva', how much saliva do you have?". *Table 2* shows that nobody reported that they had much too little saliva. However, only 77% (n=92) indicated that they had a perfect or a very good amount of saliva.

The migrant workers also responded to a question about how important their oral health was to them. Their answers were given on a five-point answer scale with 1 = "not at all important" to 5 = "very important". Not one migrant worker indicated that oral health was not important at all and only 2% that it was moderately important, whereas 98% (n=118) described it as being very or extremely important.

After providing a description of the objective and subjective oral health indicators, the next step was to explore the relationships between these two sets of responses. *Table 3* shows that the indicator of self-perceived oral health correlated significant-

ly with the sum of teeth in the front ($r=0.34$; $P<0.001$), indicating that the more teeth they had in the front of their mouths, the better they perceived their oral health to be. In addition, self-perceived oral health correlated significantly with both the clinically and the radiographically assessed number of abscesses ($r=-0.31$; $P<0.001$; $r=-0.39$; $P<0.001$), and with the clinically and radiographically assessed number of decayed teeth ($r=-0.36$; $P<0.001$; $r=-0.35$; $P<0.001$). The fewer abscesses and decayed teeth the person had, the better they thought that their oral health was.

As expected, there was no correlation between self-perceived oral health and the number of restored teeth and crowns. However, self-perceived oral health correlated significantly with the number of extracted teeth ($r=-0.48$; $P<0.001$) and the number of missing teeth due to caries ($r=-0.48$; $P<0.001$). In addition, self-perceived oral health

Table 3. Correlations Between the Objective and the Subjective Oral Health Indicators

Objective oral health indicators	Subjective oral health indicators		
	Self-perceived oral health	Dryness	Importance of oral health
Sum of teeth in front of the mouth	0.34 <i>P</i> <.001	0.51 <i>P</i> <.001	-0.04 (0.636)
Abscesses:			
- clinical	-0.31 (<i>P</i> <.001)	-0.26 (.007)	-0.08 (0.432)
- radiographic	-0.39 (<i>P</i> <.001)	-0.34 (<.001)	-0.02 (0.887)
Decayed teeth:			
- clinical	-0.36 (<.001)	-0.25 (<.011)	-0.02 (0.808)
- radiographic	-0.35 (<.001)	-0.40 (<.001)	0.09 (0.438)
Restored teeth/crowns:	-0.035	-0.079 (.416)	0.06 (0.569)
Extracted teeth	-0.48 (<0.001)	-0.40 (<.001)	0.07 (0.436)
Missing teeth due to caries	-0.48 (<0.001)	-0.43 (<.001)	0.08 (0.403)
Missing teeth due to other reasons	-0.03 (0.823)	0.15 (.173)	0.05 (0.685)
Plaque score (%)	-0.39 (<0.001)	-0.26 (0.005)	0.05 (0.563)
Gingival health*	-0.51 (<0.001)	-.24 (0.043)	-0.08 (0.505)

* Gingival health was measured with the categories: 1 = good, 2 = fair, 3 = poor.

Table 4. Correlations Between Objective and Subjective Oral Health and Oral Health-Related Behavior With the Three OHRQoL Indices

Objective oral health indicators	General OHRQoL	Psychological OHRQoL	Social OHRQoL
Sum of teeth in front of the mouth	-0.48 (<i>P</i> <0.001)	-0.18 (<i>P</i> =.065)	-0.46 (<i>P</i> <0.001)
Abscesses:			
- clinical	0.42 (<i>P</i> <0.001)	0.20 (<i>P</i> <0.055)	0.33 (<i>P</i> <0.001)
- radiographic	0.54 (<i>P</i> <0.001)	0.36 (<i>P</i> <0.001)	0.50 (<i>P</i> <0.001)
Decayed teeth:			
- clinical	0.52 (<i>P</i> <0.001)	0.47 (<i>P</i> <0.001)	0.46 (<i>P</i> <0.001)
- radiographic	0.48 (<i>P</i> <0.001)	0.63 (<i>P</i> <0.001)	0.50 (<i>P</i> <0.001)
Restored teeth/crowns:	0.09 (0.367)	0.01 (<i>P</i> <0.961)	0.04 (0.711)
Extracted teeth	0.54 (<i>P</i> <0.001)	0.18 (<i>P</i> <0.067)	0.46 (<i>P</i> <0.001)
Missing teeth due to caries	0.56 (<i>P</i> <0.001)	0.23 (<i>P</i> <0.025)	0.51 (<i>P</i> <0.001)
Missing teeth due to other reasons	0.03 (0.823)	-0.12 (<i>P</i> <0.312)	-0.09 (0.436)
Plaque score (%)	0.38 (<i>P</i> <0.001)	-0.10 (<i>P</i> <0.306)	0.36 (<i>P</i> <0.001)
Gingival health*	0.50 (<i>P</i> <0.001)	-0.41 (<i>P</i> <0.001)	0.53 (<i>P</i> <0.001)
Subjective oral health indicators			
Self-perceived oral health**	-0.55 (<i>P</i> <0.001)	-0.29 (<i>P</i> =0.002)	-0.51 (<i>P</i> <0.001)
Self-perceived dryness of mouth***	-0.43 (<i>P</i> <0.001)	-0.25 (<i>P</i> =0.009)	-0.44 (<i>P</i> <0.001)
Oral health-related behavior			
Brushing	-0.18 (<i>P</i> <0.059)	-0.02 (<i>P</i> <0.839)	-0.26 (<i>P</i> <0.004)
Flossing	-0.17 (<i>P</i> <0.071)	-0.09 (<i>P</i> <0.374)	-0.23 (<i>P</i> <0.015)

** Self-perceived oral health was measured with the question "How would you describe the health of your teeth and gums?". The answer categories ranged from 1 = poor to 5 = excellent.

*** Self-perceived dryness of mouth was measured with the question "Think about how dry your mouth usually feels. On a scale from 1 = 'much too little saliva' to 5 = 'perfect amount of saliva', how much saliva do you have?"

also correlated significantly with the percentage of teeth with plaque in a person's mouth ($r=-0.39$; $P<0.001$) and with the gingival health index ($r=-0.51$; $P<0.001$).

Concerning the relationship between the migrant workers' objective oral health and their reported dryness of mouth, *Table 3* shows that this

second subjective indicator was significantly correlated with all of the same objective oral health indicators that were correlated with the self-perceived oral health indicator.

In addition to assessing the migrant workers' objective and subjective oral health indicators, their OHRQoL was measured with the MOHRQoL—A

[21,22]. *Table 1* provides an overview of the responses to the 15 OHRQoL items as well as the average responses to the three indices General OHRQoL, Psychological Aspects of OHRQoL, and Social Aspects of OHRQoL that were computed based on the results of a factor analysis. When analysing these responses to the 15 individual items, one can argue that all responses beyond the response of 1 = “disagree strongly” and 2 = “disagree” are indicators that the respondents’ quality of life was affected. *Table 1* shows that the responses to the six items that loaded on a first factor “General OHRQoL” varied in the degree of agreement with the symptoms described. The most negative responses were given to the only item with a different response scale, namely to the item “If you would spend the rest of your life with your teeth and gums as they are right now, how would you feel about it?”. A total of 12% (n=14) of the respondents indicated that they would feel terrible and 16% (n=19) that they would feel mostly dissatisfied, whereas only 19% (n=23) indicated that they would be satisfied.

The responses to the other five items loading on this first factor “General OHRQoL” showed that substantial percentages of patients indicated that their teeth and gums make them concerned about the way they look (agree: n=16/13%; strongly agree: n=16/13%) and cause a lot of worry and concern (agree: n=12/10%; strongly agree: n=4/3%). Relatively smaller percentages indicated that their teeth and gums limit the kind or amounts of food they eat (agree: n=5/4%; strongly agree: n=7/6%) and cause discomfort (agree: n=7/6%; strongly agree: n=7/6%).

The responses to the five items loading on the second factor “Psychological OHRQoL” indicated that on the whole the psychological consequences of poor oral health on the respondents’ quality of life were relatively small. Between 0% (responses to the statement: “My teeth and gums affect my life in all of its aspects”) and 5% (n=6) of the respondents (responses to item “My teeth and gums keep me from enjoying life”) indicated that their psychological OHRQoL was impaired by their poor oral health. However, the responses to the four items loading on a third factor “Social OHRQoL” elicited stronger responses. A total of 22% (n=26) of the respondents agreed or strongly agreed with the statement “My teeth and gums make me uncomfortable when speaking in front of others”, and 19% (n=24) agreed/strongly agreed with the statement

“My teeth and gums make me uncomfortable when eating in front of others”.

Finally, it is interesting to explore whether or not the respondents’ objective and subjective oral health indicators were correlated with OHRQoL responses. *Table 4* shows that there were significant correlations between all three OHRQoL indicators and the objective indicators of oral health such as the number of clinically and radiographically diagnosed abscesses, the number of clinically and radiographically diagnosed decayed teeth, and the number of missing teeth due to caries. The three OHRQoL indices also correlated significantly with the self-perceived, subjective oral health responses and the perceived dryness of the mouth.

In addition, relationships were found between the general OHRQoL scores and the social OHRQoL scores, and the plaque score and the gingival health ratings. These OHRQoL indices also correlated significantly with the oral health-related behaviours of brushing and flossing.

Discussion

Before discussing these results, it is important to note that this was a convenience sample consisting of workers who were either recruited in a migrant worker camp site or when coming to a general health clinic. They were informed about the study and also about the fact that for a short period (four weeks), dental services were available to them free of charge. Given this recruitment strategy, the findings cannot necessarily be generalised to migrant workers at large. Nevertheless, gaining a better understanding of the extent of poor oral health and the relationships between objective and subjective oral health indicators and OHRQoL can shed light on migrant workers’ oral health-related situation and point to their extensive need for oral health care services.

The analysis of the objective oral health indicators showed that large percentages of these participants had decayed teeth and abscesses. In addition to considering these rates of untreated caries and abscesses, it is important also to be aware that some individuals had up to 24 radiographically diagnosed decayed teeth and up to eight radiographically diagnosed abscesses. This high degree of poor oral health was consistent with the findings of earlier studies [14,16,18]. It seems worthwhile in future research to explore not only the degree to which these individuals suffer from dental pain, but also the degree to which their general health is affected by this poor oral health status.

In contrast to this large degree of objectively

assessed poor oral health, 75% (n=90) of the respondents had not visited a dentist during the last year, only 45% (n=54) had restored teeth, and 53% (n=62) had extracted teeth. These data concerning the use of oral health care services show that even higher percentages of these workers were in need of oral health care than previously reported in the literature [13-16]. These data convincingly show that these respondents had significant unmet oral health care needs.

In regard to the respondents' oral hygiene status, the data show that 62% (n=74) had plaque on more than 20% of their teeth and that only 38% (n=46) of the migrant workers had sufficiently low plaque scores. This finding is not surprising given that 43% (n=52) of the migrant workers reported never to have brushed their teeth or brushing less than once a day, whereas 38% (n=46) brushed once per day, and only 18% (n=22) twice per day. In addition, only 8% (n=9) of the respondents reported flossing daily and 2% (n=2) more than once a day. Informing migrant workers about the importance of good oral hygiene efforts as a way of preventing oral disease would therefore be important. The fact that nearly all migrant workers reported that their oral health was important to them could be seen as a starting point for such educational programmes.

Despite these high percentages of respondents with diagnosed untreated decay and with dental abscesses, an analysis of the subjective oral health indicators showed that only 22% (n=26) of the respondents described their oral health as poor. However, the fact that only 18% (n=22) described their oral health as excellent or very good is clearly consistent with the objective oral health findings. It is therefore not surprising that the objective oral health indicators and the subjective oral health indicators correlated significantly.

The overview of the OHRQoL responses showed a similar pattern to that of responses to the question concerning the respondents' subjective oral health assessments. Despite the large percentages of respondents with decayed teeth and with dental abscesses, the OHRQoL responses were not as negative as might be expected. The most negative responses were given to the only item that had a different answer format. Instead of using a Likert style format, this item used an answer scale ranging from 1 = "terrible" to 5 = "satisfied". The adjectives "terrible" and "mostly dissatisfied" were likely to be seen as more descriptive than the answer alternatives on the Likert scale which ranged from

1 = "disagree strongly" to 5 = "agree strongly". This might explain why the respondents answered most negatively to this item, with 12% (n=13) indicating that it would be terrible if they were to spend the rest of their life with their teeth and gums as they were currently and 16% (n=19) that they would be mostly dissatisfied if this were the case.

An analysis of the responses to the other items showed that the respondents' oral health status did not interfere greatly with their psychological OHRQoL, although it was more likely to affect their general OHRQoL and their social OHRQoL. It seems important to understand that large percentages of these respondents showed a great resilience in living with daily pain/discomfort because of untreated caries and dental abscesses.

Despite this lower than expected level of impaired OHRQoL, the three OHRQoL indices correlated significantly with most of the objective oral health indicators such as the clinically and radiographically diagnosed number of dental abscesses or decayed teeth, as well as with the number of missing teeth because of caries. In addition to the correlations found between the three OHRQoL indices and the caries-related indicators, the generally assessed gingival health indicator and the plaque scores also correlated strongly with the OHRQoL indices.

Finally, it is worthwhile mentioning that the social OHRQoL index correlated with the degree to which respondents engaged in oral health promotion efforts and with the plaque score. Given that caries and periodontal diseases are preventable diseases, one might consider how a change in preventive behaviour could be achieved and which educational programmes could be implemented to improve the oral hygiene efforts of migrant farm workers.

Conclusions

1. A high percentage of migrant workers who participated in this study had untreated dental decay and dental abscesses.
2. Compared to the objective oral health indicators, their self-perceived oral health and the self-reported OHRQoL were more positive, indicating a certain level of resilience in this population. However, their objective oral health indicators were significantly correlated with the subjectively reported oral health indicators and with the three components of the migrant workers' OHRQoL.

3. A high percentage of respondents reported that they did not engage in positive oral health-related behaviour such as brushing and flossing; health education efforts could be targeted towards this population.
4. A high percentage of the respondents reported that they had not used oral health care services during the past year.
5. Providing access to care for this population should be a priority.

References

1. Kandel W. *Profile of Hired Farmworkers, A 2008 Update*. Economic Research Report No. ERR-60. July 2008. Washington, DC: US Department of Agriculture Economic Research Service; 2008. Accessed (2010 Apr 22) at: <http://www.ers.usda.gov/publications/err60/>
2. The National Agricultural Workers Survey (NAWS). Washington, DC: US Department of Labor Employment and Training Administration. Accessed (2010 Apr 22) at: <http://www.dol.gov/asp/programs/agworker/naaws.htm>
3. Carroll DJ, Samardick R, Bernard S, Gabbard S, Hernandez T. *Findings from the National Agricultural Workers Survey (NAWS) 2001-2002: A Demographic and Employment Profile of United States Farmworkers*. Research Report No. 9. Washington, DC: US Department of Labor, Office of the Assistant Secretary for Policy, Office of Programmatic Policy; 2005.
4. Villarejo D, Baron SL. The occupational health status of hired farmworkers. *Occupational Medicine* 1998; **14**: 613-635.
5. Villarejo D. Hired farm worker health needs assessment. *Changing Face* 2000; **6**(4). Available from: http://migration.ucdavis.edu/cf/more.php?id=65_0_2_0
6. Shipp EM, Cooper SP, Burau KD, Bolin JN. Pesticide safety training and access to field sanitation among migrant farmworker mothers from Starr County Texas. *Journal of Agricultural Safety and Health* 2005; **11**: 51-60.
7. US Government Accountability Office (GAO). *Foreign Farm Workers in U.S.: Department of Labor Action Needed to Protect Florida Sugar Cane Workers*. Washington, DC: GAO; 1992.
8. Centers for Disease Control and Prevention (CDC). *Heat-Related Deaths Among Crop Workers—United States, 1992-2006*. Atlanta, GA: CDC; 2008. Accessed (2010 Apr 22) at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5724a1.htm>
9. Holmes SM. An ethnographic study of social context of migrant health in the United States. *PLoS Medicine* 2006; **3**: 1776-1792.
10. Hansen E, Donohoe M. Health issues of migrant and seasonal farm workers. *Journal of Health Care for the Poor and Underserved* 2003; **14**: 153-163.
11. Mobed K, Gold EB, Schenker MB. Occupational health problems among migrant and seasonal farm workers. *Western Journal of Medicine* 1992; **157**: 1-5.
12. Labor, H-1B, census, health. *Migration News* 2004; **11**: 4. Accessed (2010 Apr 22) at: http://migration.ucdavis.edu/MN/more.php?id=3046_0_2_0
13. Lukes SM, Miller FY. Oral health issues among migrant farm workers. *Journal of Dental Hygiene* 2002; **76**: 134-140.
14. Entwistle BA, Swanson TM. Dental needs and perceptions of adult Hispanic immigrant farmworkers in Colorado. *Journal of Dental Hygiene* 1989; **63**: 286-292.
15. US Department of Health and Human Services. *Health, United States, 2009*. Hyattsville, MD: National Center for Health Statistics; 2010. Accessed (2010 Apr 22) at: <http://www.cdc.gov/nchs/hus.htm>
16. Quandt SA, Hiott E, Grzywacz JG, Davis SW, Arcury TA. Oral health and quality of life of migrant and seasonal farmworkers in North Carolina. *Journal of Agricultural Safety and Health* 2007; **13**: 45-55.
17. Lombardi GR. Dental/oral health services. *Migrant Health Issues, Monograph Series* 2002; **1**: 1-8.
18. Lukes SM, Simon B. Dental decay in southern Illinois migrant and seasonal farmworkers: an analysis of clinical data. *Journal of Rural Health* 2005; **21**: 254-258.
19. Inglehart MR, Bagramian RA, editors. *Oral Health and Quality of Life*. Chicago, IL: Quintessence; 2002.
20. Henson B, Inglehart MR, Eisbruch A, Ship J. Preserved salivary output and xerostomia-related quality of life in head and neck cancer patients receiving parotid-sparing radiotherapy. *Oral Oncology* 2001; **37**: 84-93.

