Oral health strategy for the older people in Social Protection Centers in Villavicencio, Colombia

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Abstract:

**Purpose** - To design and to implement an oral health educational strategy that targeted an older population residing in three Social Protection Centers (SPC) in Villavicencio, Colombia.

**Design/methodology/approach** - The first phase consisted in determining the oral health of older citizens in the SPC. To do this, the research group gathered patients’ personal information and indices. The second phase consisted in the development of an educational strategy based on the population’s requirements. The educational strategy, focusing on oral hygiene and denture care, was implemented for the older people and their caregivers. The third and final phase consisted in the research group measuring the effect of the designed strategy by repeating oral diagnoses for the older people six months after strategy implementation. **Findings** - The results of the assessment indicated that implementing a strategy to strengthen oral hygiene care was positive, given that statistically significant reductions were observed in the Soft Plaque Index and the Gingival Index ($p<0.05$). **Research limitations/implications** - As a result of the complexity of the population, the data obtained after the strategy was implemented were significantly reduced. However, these results indicate that an educational strategy can have an effect on this type of population. **Originality/value** - Implementing a strategy that promotes oral hygiene education and brushing skills, fosters good oral behavior and helps the older people in SPC to remember the information taught, thus contributing to their oral hygiene.

**Keywords:** Older People, Oral Health, Health education

**Paper type** Research paper
Introduction

According to the World Health Organization, the ageing process is a biological reality with its own dynamic (World Health Organization, 2002), and is subject to the way different societies make sense of the process through the development and maintenance of health during old age (World Health Organization, 2015). The ageing process becomes noticeable after the age of sixty, and it becomes more intense and complicated as the individual gets older (Strait and Lakatta, 2012). Our organic and physiological requirements involve tissues, organs, systems, self-esteem, and interpersonal and emotional relationships. On a biological level, the changes that take place as a result of ageing are due to the accumulation of molecular and cellular damage that, over time, gradually reduce physiological reserves, increase the risk of illness and reduce the individual’s general capacity (World Health Organization, 2015).

Diseases of the oral cavity are some of the most commonplace in older adults, as are dental caries and periodontal pathologies. These contribute to tooth loss, xerostomia, premalignant lesions, oral cancer, and other lesions of the oral mucosa (Colussi CF and De Freitas SF, 2009). Nutritional problems and difficulties in swallowing; taste and smell disorders; experiencing pain whilst eating, chewing, smiling, speaking, and in some cases psychological disorders can all be the result of such diseases (Henriksen et al, 2004). Moreover, it has been proven that poor oral health increases the risk of cerebrovascular and cardiovascular diseases, diabetes, and pneumonia (Beck JD, 1998; Meurman and Sanz, 2004; Lamster et al, 2008).

Over recent years, the older population has increased as a result of declining mortality and fertility rates (Ferrucci et al, 2008). The last census in Colombia counted 2,617,240 people over the age of 65 in the country, half of whom are from modest- or low-income families (DANE, 1985). The projection for 2020 points to there being 4,328,580 people over the age of 65 (DANE, 1985) meaning that this population will have increased by 65.39% since 2005. The IV National Study of Oral Health in Colombia showed that among the population aged 65 to 79, 96.26% have dental caries and 43.47% have a prevalence for them. The Decayed, Missing, Filled Teeth Index (DMFT) index for people aged 65 to 79 is 20.55% and 98.90%
presents partial tooth loss (MINSALUD, 2015). This should be a driving factor that forces the State and other relevant institutions to establish policies and programs that strengthen the care provided for an ever-growing and vulnerable group.

In Colombia, Social Protection Centers (SPC) for the older citizens are places that provide either permanent or temporary housing (MINSALUD, 2009). The Obra Social San Camilo, Casa del Divino Niño and San José are among the care facilities in which some of the older people are financially supported by Villavicencio Town Hall. The older citizens are given basic medical coverage that is provided by the Colombian Health Care System, but they receive no dental coverage for any diagnoses or treatment they may require, or any oral hygiene guidelines or protocols.

The objective of this study was to develop and to implement an educational strategy to improve the oral hygiene habits in the older population living in these three centers, and to help them recognize that it is an important part of their general healthcare, which, in turn, contributes to their quality of life.

Methods:

This study was a quasi-experimental design before and after study with no control group, applied through community intervention which consisted in the following phases:

*Phase 1. Diagnosis of older citizens’ oral health.*

The study was carried out with a sample of older citizens (n=68) in San Camilo, Divino Niño Jesús, and San José SPC, all in Villavicencio, Meta, Colombia. The subjects all had to meet the inclusion criteria such as being financed by the town hall, be in good mental and physical health, and have signed an informed consent form agreeing to participate. This study adhered to all the international requirements set forth by the Declaration of Helsinki as well as Resolution 8430 of 1993 of the Colombian Ministry of Health. It was also approved by the University Research Ethics Sub-Committee.

In order to gather the information, assessment instruments were used that allowed the identification of variables classified under the following headings: personal information, general health condition, illnesses, habits, etc. The instruments used to measure oral
conditions where the following: the Decayed, Missing, Filled Teeth Index (DMFT); the Löe-Silness Gingival and Plaque Index; the Community Periodontal Index of Treatment Needs (CPITN), the General Oral Health Assessment Index (GOHAI), which assesses oral health-related quality of life in the older population; and an instrument to gather the most common oral manifestations in soft tissue in older subjects. The CPITN, the Löe-Silness Gingival Index, and DMFT were only used for those patients with teeth (Figure 1).

Figure 1: The methodology used in the three social protection centers in Villavicencio.

Source: Authors’ own

The oral exam was carried out by dental students assessed by a panel of experts in each of the following areas: periodontics, oral rehabilitation, and oral pathology. Kendall's coefficient of concordance (Kendall’s W) was used to determine the level of inter-examiner agreement. The result (0.75-0.85) proved that the measurements resulting from the different indices were reliable.

Phase 2. Design and implementation of the educational strategy.
Based on the information gathered during the assessment, an educational strategy was designed to: a) Improve knowledge of oral hygiene, b) promote brushing skills, c) promote correct oral behavior, and d) ensure that the information received is remembered (Figure 2).

*Figure 2: Strategy design and implementation*

Three sessions were held on three different days to implement the strategy. The first was specifically aimed at the caregivers (auxiliary nurses), and consisted in a 30-minute informal lecture on oral care awareness. In the second, each older person and caregiver was shown a 3D handbook containing techniques for oral and dental prostheses hygiene. They were taught brushing techniques (for both teeth and the prosthesis) by following the instructions in the handbook and using the assisted brushing method. Each participant then repeated what he or she had been shown whilst being supervised. This activity lasted 20 minutes with each participant. The last session, which lasted an hour and a half, took place a week later.
In it, the participants were asked about the process they had been taught, and a CD was played to make sure they remembered the activities.

**Phase 3. Measuring the impacts of the strategy.**

In order to measure the impact of the educational strategy, another oral assessment of the older subjects was carried out six months after strategy implementation. Only the measurements related to the participants who were involved in the first and final phases of the study were used for impact assessment. The total population was reduced as a result of several participants dying, other participants being moved to different SPC, and others who simply did not want to take part in the second assessment. The total number of older citizens that were assessed before and after was 40; however, fewer were assessed according to the indices (Figure 1).

**Statistical Analysis**

SPSS 20.0 was used for the data analysis. A univariate exploratory data analysis was carried out (frequency distribution, bar chart, descriptive analysis to determine relative frequencies, means, and medians as well as the corresponding statistical dispersions such as standard deviations), followed by a descriptive analysis to determine relative frequencies, means, and medians as well as the corresponding statistical dispersions (standard deviations). In order to determine the impact of the strategy (to validate whether there are significant differences between those measurements that were taken before the intervention and those taken six months after), different hypothesis tests were used as follows: McNemar’s chi-square test (to determine the number of good cases using the GOHAI) and the number of periodontal diseases according to the CPITN (before-after). The Student’s t test was also used for related samples and the Wilcoxon signed-rank test for the DMFT and the Gingival and Plaque Index.

**Findings**

**Characteristics of the evaluated population**

The average age of the evaluated population was 78.6 (±9.5 years), with a minimum age of 65 and a maximum age of 106. The majority of participants were male (69.1%). According
to their medical histories, 78% of the population suffered from some kind of illness, the most common of which included those related to the cardiovascular (57%) and nervous systems (12%). Some 88% of the population was taking medication. In terms of oral hygiene habits, 79% of the population brushed their mouth, teeth, and dental prosthesis with a toothbrush, 74% used toothpaste, and only 7% used dental floss.

**Phase 1. Initial assessment of older citizens’ oral health**

**Evaluation of hard tissue, dental plaque, the gingival index, and periodontal disease.**

Some 85.7% of the older population who still had teeth (n=24) had dental caries, 7% (n=2) had dental fillings, and 100% (n=28) had missing teeth. The total average for the DMFT, bacterial plaque and gingival indices are shown in tables 2 and 3. Seventy-four percent (n=20) of the population evaluated presented a high-risk factor. Of the 21 older people for whom the CPITN index could be applied due to the fact they had at least two teeth in some of the sextants, 95.2% were in need of some type of periodontal treatment. Some 38.1% (n=8) presented bleeding during the procedure, 23.8% (n=5) had calcified plaque, and 33.3% (n=7) had 4 to 5 mm periodontal pockets.

**Edentulism and dental prostheses**

One hundred percent of the population (n=68) had missing teeth (minimum of 4, and a maximum of 28), with a total average of 23.3 ± 6.9 missing teeth. From the total population examined, 48.5% (n=33) had complete edentulism, and 51.5% (n=35) had partial edentulism, with an average of 4.7 ± 6.9 teeth, and 47% of individuals (n=32) had dental prostheses. Of the 68 older citizens examined, 77.94% (n=53) manifested the need for a dental prosthesis or a replacement for one they already had.

**Evaluation of soft tissue**

It was identified that 19% (n=13) of the assessed population had oral manifestations. The most prevalent were varicose veins (8.8%), coated tongues (4.4%), and minor aphthous ulcerations (2.9%).

**General Oral Health Assessment Index (GOHAI)**
The average GOHAI score was 43.9 (± 8.2). This corresponds to a low self-perception of quality of life and is related to a poor state of oral health. Table 5 provides data on Physical, Psychosocial and Pain functions.

Phase 2. Design Strategy

In this study, the plaque and gingival indices and the need for periodontal treatment are indicators of poor oral hygiene. As such, an educational strategy was designed to promote oral hygiene knowledge and skills to make taking care of oral hygiene and dental prosthesis easier (Figure 2).

1. A CD and a 3D handbook were designed and implemented in order to improve knowledge of oral hygiene. These included bright colors and photos that were taken of the participants during the study, making them the protagonists. This material detailed the important steps to be taken in order to ensure good oral hygiene and dental prosthesis maintenance.

2. The caregivers and the older participants were taught and encouraged to use brushing technique skills with the help of dental models and guided brushing.

3. The participants were given an oral hygiene kit made up of a toothbrush, toothpaste, and mouthwash to support behavior that promotes oral care.

4. To remind the participants of all the necessary information, a CD and handbook were left in their accommodation to help caregivers remind them of the importance of oral hygiene and prosthesis-maintenance.

When implementing the strategy, it was the caregivers that showed the most interest and commitment to applying what they had learned to the people in their care.

Phase 3. The strategy’s impact

Table 1 shows the average DMFT, the average number of decayed teeth with caries, the average for teeth with fillings and lost teeth six months after strategy implementation. Analyzing the impact of the strategy showed that there was no significant difference (p>0.05) in the average number of decayed, filled, or lost teeth in the older people evaluated before and after (n=15) strategy implementation (Table 1).
Table 1: DMFT Index. Before and after strategy implementation

<table>
<thead>
<tr>
<th></th>
<th>Before strategy</th>
<th>After strategy</th>
<th>(t) test for related samples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Median</td>
<td>Standard deviation</td>
<td>Median</td>
</tr>
<tr>
<td>Decayed teeth</td>
<td>7.4</td>
<td>6.8</td>
<td>6.3</td>
</tr>
<tr>
<td>Filled teeth</td>
<td>0.3</td>
<td>0.8</td>
<td>0.9</td>
</tr>
<tr>
<td>Teeth missing due to caries</td>
<td>16.5</td>
<td>7.7</td>
<td>17.7</td>
</tr>
<tr>
<td>DMFT Index</td>
<td>24.2</td>
<td>4.8</td>
<td>24.8</td>
</tr>
</tbody>
</table>

Source: Authors’ own

The Silness and Löe Plaque Index highlights significant differences for before and after the implementation \((p<0.05)\). There is a reduction in the amount of plaque after strategy implementation \((2.23\pm0.69\ SD)\) when compared with before implementation \((2.38\pm0.74\ SD)\). The Wilcoxon signed-rank test was taken into consideration to validate the normality hypothesis \((p<0.05)\) (Table 2).

Table 2: The Silness and Löe Plaque Index before and after strategy implementation.

<table>
<thead>
<tr>
<th>Silness and Löe Plaque Index</th>
<th>Median</th>
<th>Standard deviation</th>
<th>Normality</th>
<th>Wilcoxon test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before</td>
<td>2,38</td>
<td>0,74</td>
<td>0,01</td>
<td>0,01</td>
</tr>
<tr>
<td>After</td>
<td>2,23</td>
<td>0,69</td>
<td>0,278</td>
<td></td>
</tr>
</tbody>
</table>

Source: Authors’ own

Six months after strategy implementation, the average gingival index of the population that were still part of the study was 2.01±0.7 in comparison to the initial measurement of 2.37±0.74, indicating a significant reduction \((p<0.05)\) (Table 3). The CPITN results did not
detect a significant change in the before and after assessments (p>0.05) of the older people who were evaluated twice (n=12) (Table 4).

Table 3: Gingival Index before and after strategy implementation

<table>
<thead>
<tr>
<th>Silness and Loe Plaque Index</th>
<th>Median</th>
<th>Standard deviation</th>
<th>Normality</th>
<th>Wilcoxon test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before</td>
<td>2.38</td>
<td>0.74</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>After</td>
<td>2.01</td>
<td>0.71</td>
<td>0.09</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Source: Authors’ own

Table 4: Contingency table showing the presence of periodontal disease, according to the CPITN.

<table>
<thead>
<tr>
<th>Periodontal Disease</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>No</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

p (McNemar’s chi-square test) 0.22

Source: Authors’ own

In terms of the GOHAI, the average after strategy implementation was 40.7, corresponding to a low self-perception of quality of life. In this population, 82.5% (n=33) reported having a low self-perception of quality of life, 17.5% (n=7) reported a fair self-perception, and no individual reported a high self-perception (data not presented). The result for after strategy implementation was 2.8 points less than the average during the assessment phase, representing a statistically significant reduction (p<0.05) (Table 5), particularly in terms of psychosocial and pain functions.
Table 5. GOHAI before and after strategy implementation

<table>
<thead>
<tr>
<th>Function</th>
<th>Median Before</th>
<th>Standard Deviation Before</th>
<th>% Change</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total GOHAI</td>
<td>43.9</td>
<td>8.28</td>
<td>-7.2</td>
<td>0</td>
</tr>
<tr>
<td>After</td>
<td>40.7</td>
<td>9.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical function</td>
<td>17.4</td>
<td>4.38</td>
<td>-9.1</td>
<td>0.12</td>
</tr>
<tr>
<td>After</td>
<td>15.8</td>
<td>4.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychosocial function</td>
<td>17.8</td>
<td>4.88</td>
<td>-6.8</td>
<td>0.02</td>
</tr>
<tr>
<td>After</td>
<td>16.6</td>
<td>4.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain or discomfort function</td>
<td>8.67</td>
<td>1.95</td>
<td>-4.3</td>
<td>0</td>
</tr>
<tr>
<td>After</td>
<td>8.3</td>
<td>1.68</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Authors’ own

Discussion

The purpose of this study was to assess the oral health conditions of older citizens in three SPC in Villavicencio in order to establish an oral health strategy adapted to their particular needs and characteristics. Older citizens are a particularly heterogeneous population in terms of their physiological conditions, as each individual is a particular case constituted by genetic, nutritional, habitual, economic, and social factors (Meurman and Sanz, 2004). This study reflected this heterogeneity on a physiological level, as the general health of the population under study was determined using medical records. As a result of these chronic conditions, 88% of the population took some form of medication. Several studies have shown a direct relationship between diseases and the taking of medication with oral health (Kim and Amar, 2006; Javed and Warnakulasuriya, 2015). As some authors conclude, oral changes that are often reported in older citizens are more likely to be related to systemic diseases, the side effects of some medication, and other factors (hygiene, cultural, social,
etc.), than they are to tissue changes due to the ageing process (Joya and Quintero, 2015; Masood et al., 2016; Paredes-Rodriguez et al., 2016).

At the beginning of the study, it was identified that 85% of the older participants who were evaluated had dental caries, 74.1% presented a high risk factor according to the bacterial plaque and gingival index, 33.3% had periodontal disease, 50% were partially edentulous and the other 50% completely edentulous, and 76.5% had a low self-perception of their oral health according to the GOHAI. If it is true that periodontal disease, dental caries, edentulism, and low evaluation are characteristics of oral health in older citizens, then establishing appropriate methods to address these problems should reduce these indices (Colussi CF and De Freitas SF, 2009; Griffin et al., 2012). Instead of simply accepting that these disease conditions are characteristic of old age, better oral conditions can be established that contribute to older citizens’ general wellbeing (Mariño et al., 2013).

The DMFT Index is an indicator that increases with age and this is made clear in different studies (Henriksen et al, 2004; Liu et al., 2013; Joya and Quintero, 2015; MINSALUD, 2015; Singh et al, 2015). In this study, the population assessed for the DMFT Index had an average of 18 teeth missing, and the lost teeth component increased the DMFT Index figure to an average value of 24.89. The percentage of older study participants with dental caries was 85.7%, a figure that is well above the average found by the National Oral Health Study (MINSALUD, 2015). This is most probably due to the fact that the type of population evaluated was an institutionalized population dependent on the public system. No significant differences were found in the DMFT Index after strategy implementation. This was expected given that this measure would never decrease despite the implementation of strategies or treatments.

A large percentage of the population examined at the beginning of this study (74%) presented a high risk according to the soft plaque and gingival indices, with an index average of 2.7, indicated a need to develop an oral health education. The population assessed six months after strategy implementation, presented a statistically significant reduction in terms of the dental plaque and gingival indices. This tells us that the strategy has had a positive effect on older citizens’ oral health. Studies undertaken in other countries
Isaksson, 2000; Nicol et al., 2005; Petersen and Yamamoto, 2005; Kullberg et al., 2010; Pronych et al., 2010; Weening-Verbree et al., 2013; Lacroix et al., 2016) have also shown a positive effect as a result of oral health educational programs among older citizens who live in SPC. These programs employed various strategies including training older citizens’ in oral hygiene, lectures and videos (Nicol et al., 2005), and caregiver training. It is important to take into consideration that, for the most part, the success of the strategies goes hand-in-hand with the knowledge and commitment of the caregivers (Isaksson, 2000; Nicol et al., 2005; Kullberg et al., 2010). As stated in Boczko et al, if caregivers are not well informed regarding oral hygiene measure, the risk of poor oral hygiene for CPS residents is greatly increased. Studies in which the strategy has focused on the caregivers have provided the best results in terms of oral hygiene (Nicol et al., 2005; Kullberg et al., 2010; Pronych et al., 2010).

No effect was detected on the population sample in relation to periodontal disease due to the fact that specific periodontal treatments need to be provided in order for changes to take place. Unfortunately, this study was unable to provide these treatments; however, the SPC were requested to refer the older to specialized institutions. It is worth noting that as the strategy contributes to oral hygiene it will also contribute to improving periodontal health. According to the WHO, the only methods available to control periodontal disease are the frequent physical removal of dental plaque or disrupting its growth by using instruments to support oral hygiene and the removal of subgingival calculus by a specialized professional (World Health Organization, 1984).

The results showed that 48.5% of the population was completely edentulous and 51.5% was partially edentulous with an average of 4.7 teeth, indicating insufficient oral functionality. This score is lower than other studies, such as in Joya and Quintero, (average number of teeth: 11) (Joya and Quintero, 2015) and in Láuro et al (average number of teeth: 9) (Rodrigues et al., 2012). Joya and Quintero state that, according to the World Dental Federation (FDI), at least 20 teeth are needed to guarantee functionality. The global goal is for 50% of older citizens to have at least this number of teeth (Joya and Quintero, 2015). The IV National Study of Oral Health found that 32.9% of the senior citizen population
studied was edentulous and had an average of 20 missing teeth per individual (MINSALUD, 2015). In this study, some of the population had dental prostheses in order to improve the functionality of the oral cavity and their general wellbeing. However, dental prostheses were only fixed in older citizens whose alveolar ridge was wide and high enough and who did not need any further specialized treatments.

On the two occasions on which GOHAI was used—in the diagnostic phase and the impact assessment phase—the results revealed a low quality of life perception. The GOHAI measurement undertaken before and after strategy implementation showed statistically significant changes, particularly for the psychosocial and pain functions. The values obtained after strategy implementation were lower than those obtained in the diagnostic phase. This does not mean that the strategy was not effective. On the contrary, it was effective inasmuch as it made older citizens more aware of their oral health. Oral health education is effective in improving the awareness (Nakre and Harikiran, 2013). In fact, the WHO recommends among the strategies towards improved oral health of older people, public health programmes focus on enhancing awareness of the importance of oral health (Petersen and Yamamoto, 2005).

It is clear that in order to increase the GOHAI values, a comprehensive intervention is required that offers the treatment required to improve the physical, psychosocial, and pain functions.

Conclusions

In accordance with the dental plaque, gingival, and periodontal indices, this study developed an educational strategy directed at caregivers and the older people. The purpose was to promote knowledge of oral hygiene, improve technical brushing ability, render good oral behavior easier to carry out, and finally, to help all those involved remember the information provided. Impact measurement showed a significant effect on the dental plaque and gingival indices suggesting that the educational strategy improved this population’s oral conditions.
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