Investigation of Behavioral Changes and Their Impact on Oral Health Status in a Representative Group of Patients

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Abstract
Oral health-related behavior change is much more than just the provision of information, aimed at creating the favorable environment for the development of safe behaviors. The research process aimed to select a behavioral change package for the patients involved and assess the oral health status in dynamics.

Keywords: Behavioral interventions, Behavior change, oral health, DMFT (Decayed, Missing, and Filled Teeth) Index, Gingival Index, Periodontal Indices

Introduction
Behavioral interventions - are the interventions encompassing the knowledge or instructions on oral health and disease management practices, and the ways to manage the psychological and social challenges affecting the oral health related behaviors (1,3,4, 6).
According to the literary sources: "Behavior change is much more than just the provision of information, aimed at creating the favorable environment for the development of safe behavior and lowering barriers to behavior changes, thereby trying not to specify, dictate or ask people to change their behavior, but persuade the target audience to act." (7)
The research process aimed to select a behavioral change package for the patients involved and assess the oral health status in dynamics (2,6).

Materials and methods of the Study:
Behavioral changes and their importance for oral health have been studied in a representative group of patients involved.

The patients were selected from 4 different clinics of dental profile of Tbilisi. Patients were included in the study only after obtaining their informed consent. For this study, oral health care tips and recommendations have been developed in advance, and these recommendations were common to all.

After that, the patients were provided with a minimal list of behavioral packages, taking into account patients' personalized behavioral pattern as well as their readiness/willingness to change behavior, specially adapted for them taking into account all barriers (geographic, financial, psychological, etc.) and the individual behavioral practice of the patient, prepared by the researchers with further handing to every patient to follow until the next visit.

First, the next visit was scheduled for a specific purpose in at least 5 and at most 6 months (taking into account the patient's agenda), and then, within the same timescale, repeatedly.

Recommendations for patients:

Cleaning teeth and interdental surfaces using brushes and dental floss daily;
Using fluoride to increase the strength of tooth tissue and dental resistance to diseases;
Choosing the right type of diet/food: proper consumption of carbohydrate foods, moderate consumption of alcohol-free drinks, rejection/refusal of bad habits (specific bad habits referred verbally, taking into account their abundance and diversity);

Tobacco consumption;
Alcohol consumption;
Routine visit appointment to the dentist (excluding dental treatment and emergency appointments).

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First, the next visit was scheduled for a specific purpose in at least 5 and at most 6 months (taking into account the patient's agenda), and then, within the same timescale, repeatedly.

During this period, the researchers contacted patients once a month to provide supportive counseling, thereby promoting probability of desired behavioral change.

At the repeated visit, every patient was required to pass the interview for choosing the mode and scope of implementation of the packages of behavioral change interventions (BCI). It was followed by providing repeated assessment of oral health status and recording behavior changes.

During the visit: the causes and barriers of uncommitted behavioral changes were being observed; additional consultations scheduled; all records were done in the journal specially kept for this reason. All patient records carry identifying number. Opposite the patient's identifying

number (Identification code-assigned to the patient, involved in the study, at the first visit) should be recorded as follows: demographic data, oral health status, behavioral habits of the patient, behavior change tips and recommendations, and date of the repeated visit. At the next visit, behavioral changes were recorded opposite the identification code, after which the patient's oral health was assessed. The oral health status has been assessed applying the DMFT, Gingival, and Periodontal Indices. The obtained data were processed statistically using descriptive statistic tool. The groups were assessed by χ^2 test.

It is important to emphasize that oral health is closely related to behavioral factors, and a single visit to the dentist and providing adequate treatment is not a guarantee of oral health or a basis for maintaining oral health status in case of repeated misconduct. Following this logical line, it turns out that behavioral changes are more important than any other interventions in terms of oral health, as behavioral change provides a solid and complete guarantee to avoid oral health problems that can be prevented in general.

Results of the Study

780 patients were involved in the behavioral change assessment segment, 576 of which were men and 204 women, respectively. The mean age of the patients involved: women-41.7 ± 13.9 years (Mean ± SD), men-44.3 ± 13.6 years (Mean ± SD) but for testing the mean age was 42.4 ± 13.9 years (Mean ± SD), respectively.

After repeated visits (monitoring behavior patterns was carried out for 6 + 6 months), among the patients involved in the research 335 did not make any behavioral changes, while445 (278 men and 167 women) committed these changes.

The pattern of behavior changes in the patients involved in the study can be presented as follows:

1. Reverse tobacco smoking habit (quit smoking) -2 patients (women);
2. Limited alcohol consumption – 17 patients (4 men and 13 women)
3. Refused sweet foods (sugar-containing products and sweet carbonated beverages) - 386 patients (198 men and 188 women);
4. 17 patients had specific bad habits and the absolute majority managed to change them (8 men and 9 women).

As for the oral health status in patients who committed behavior changes, in this study it was presented as follows:
Behavioral changes were observed in 278 men, and oral health status, especially the DMFT index (positive dynamics), improved in 196 cases.

Behavioral changes were observed in 167 women, and oral health status, especially the DMFT index (positive dynamics) improved in 89 cases.

In total, among the patients involved in the study, who succeeded in achieving behavioral changes, the DMFT index improved in 285 cases.

In men, who achieved changes in their behavior, the gingival index improved in 113 cases; and among the women – in 75 cases, respectively; in total, among the patients involved in the study, who succeeded in achieving the behavioral changes, the gingival index improved in 188 cases.

Improvement of periodontal index was observed in 125 men and 62 women who managed to achieve behavior changes.

In total, among the patients involved in the study, who succeeded in achieving behavioral changes, periodontal index improved in 188 cases.

The indicators of oral health dynamics assessed according to oral health indices (DMFT, Gingival, and Periodontal) in the patients with-or without behavior changes, are given in the tables below (Table 1, Table 2, Table 3).

Table #1 Dynamics of DMFT (Decayed, Missing, and Filled Teeth) Index among the Persons involved in Survey on Behavior Changes by Age and Gender.

		Behavior change		No behavior change	
Gender	**Dynamics**	**n=**	**%**	**n=**	**%**
Men	**Positive**	196	68.8%	107	35.7%
	Dynamics-not observed	63	22.8%	150	50.0%
	Negative	17	9.4%	43	14.3%
Women	**Positive**	89	53.3%	6	16.2%
	Dynamics-not observed	42	25.1%	15	40.5%
	Negative	36	21.6%	16	43.3%
In total	**Positive**	285	64.3%	113	33.5%
	Dynamics-not observed	105	23.7%	165	49.0%
	Negative	53	12.0%	59	17.5%

Table #2 Dynamics of the Gingival Index among the Persons involved in Survey on Behavior Changes byAge and Gender

		Behavior change		No behavior change	
Gender	**Dynamics**	**n=**	**%**	**n=**	**%**
Men	**Positive**	113	40.9%	102	34.0%
	Dynamics-not observed	115	41.7%	106	35.3%
	Negative	48	17.4%	92	30.7%
Women	**Positive**	75	44.9%	4	10.8%
	Dynamics-not observed	73	43.7%	9	24.3%
	Negative	19	11.4%	24	64.9%
In total	**Positive**	188	42.4%	116	29.1%
	Dynamics-not observed	188	42.4%	125	38.9%
	Negative	67	15.1%	96	31.9%

Table #3 Dynamics of the Periodontal Index among the Persons involved in Survey on Behavior Changes byAge and Gender

		Behavior change		No behavior change	
Gender	**Dynamics**	**n=**	**%**	**n=**	**%**
Men	**Positive**	125	45.3%	101	33.7%
	Dynamics-not observed	111	40.2%	160	53.3%
	Negative	40	14.5%	39	13.0%
Women	**Positive**	62	37.1%	5	13.5%
	Dynamics-not observed	67	40.1%	19	51.4%
	Negative	38	22.8%	13	35.1%
In total	**Positive**	187	42.2%	124	36.8%
	Dynamics-not observed	178	40.2%	161	47.8%
	Negative	78	17.6%	52	15.4%

Discussion of the Study Results

Current research, obtained results and their statistical analyses allow us to state that behavior change has a positive impact on oral health causing positive dynamics in all its criteria, especially in the DMFT, gingival and periodontal indices:

DMFT (Decayed, Missing, and Filled Teeth) Index

In terms of oral health, the DMFT index appeared to be better in the group of men with behavior changes compared to the group without the changes.

$$\chi^2 = 72.067 \quad p<0.0001$$

As for the women involved in the study, (like the men), oral health status (DMFT index) improved by a much higher percentage in the group of patients, who committed behavior changes compared to the group without changes.

$$\chi^2 = 17.098 \quad p=0.0002$$

In a pooled group of respondents (both male and female), the positive dynamics in oral health status appeared to be much better among the individuals who committed behavioral changes than in those without it, and it should be emphasized that our assumption is statistically reliable.

$$\chi^2 = 74.966 \quad p<0.0001$$

Gingival Index:

In patients, who committed behavioral changes, both women ($\chi^2 = 53.038$ p<0.000), and men ($\chi^2 = 13.782$ p=0.001), the oral health status, in particular a gingival index, improved in a higher percentage in comparison with the ones who show no changes in their behavior.

In a pooled group of respondents (both male and female), the positive dynamics in oral health status (gingival index) appeared to be much better among the individuals who committed behavioral changes than in those without it, and our assumption is statistically reliable.

$$\chi^2 = 20.873 \quad p<0.0001$$

Periodontal Indices

According to the study results, in patients, who committed behavioral changes, both women ($\chi^2= 7.905$ p=0.019), and men ($\chi^2 = 10.439$ p=0.005), the oral health status, in particular a periodontal index, improved in a higher percentage in comparison with the ones who show no changes in their behavior.

However, in this regard one interesting fact should be emphasized: the improvement of the periodontal index in a common group of respondents was not statistically reliable compared to the groups of women and men taken separately. $\chi^2 = 4.492$ p=0.109 (unreliable)

Consequently, as a result of the study, the following conclusions were made:

1. Behavior change is associated with oral health, has a positive impact on oral health and improves it, in particular, the DMFT index and this association is statistically reliable.
2. Behavior change is associated with oral health, has a positive impact on oral health and improves it, in particular, the gingival index and this association is statistically reliable.
3. Behavior change is associated with oral health, has a positive impact on oral health and improves it, in particular, the periodontal index and this association is statistically reliable in the samples of both male and female, separately. However, within the current research, nostatistically reliable relation between oral health and behavioral change regarding periodontal index was observed in a pooled group of patients involved in the study.

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