TIBBIYOT
TA'LIMI & INNOVATSIYALARI

O'ZBEKISTON RESPUBLIKASI
TOSHKENT TIBBIYOT AKADEMIYASI
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- 14.00.00 - Tibbiyot fanlari;
- 14.00.01 - Akusherlik va ginekologiya;
- 14.00.02 - Morfologiya;
- 14.00.03 - Endokrinologiya;
- 14.00.04 - Otorinolaringologiya;
- 14.00.05 - Ichki kasalliklar;
- 14.00.06 - Kardiologiya;
- 14.00.07 - Gigiena;
- 14.00.08 - Oftal'mologiya;
- 14.00.09 - Pediatriya;
- 14.00.10 - Yuqumli kasalliklar;
- 14.00.11 - Dermatologiya va venerologiya;
- 14.00.12 - Tibbiy reabilitologiya;
- 14.00.13 - Nevrologiya;
- 14.00.14 - Onkologiya;
- 14.00.15 - Patologik anatomiya;
- 14.00.16 - Normal va patologik fiziologiya;
- 14.00.17 - Farmakologiya va klinik farmakologiya;
- 14.00.18 - Psixiatriya va narkologiya;
- 14.00.19 - Klinik radiologiya;
- 14.00.20 - Tibbiy genetika;
- 14.00.21 - Stomatologiya;
- 14.00.22 - Travmatologiya va ortopediya;
- 14.00.23 - Hamshiralik ishini tashkil etish;
- 14.00.24 - Sud tibbiyoti;
- 14.00.27 - Xirurgiya;
- 14.00.28 - Neyroxirurgiya;
- 14.00.41 - Xalq tabobati;
- 14.00.35 - Bolalar xirurgiyasi;
- 14.00.34 - Yurak-qon tomir xirurgiyasi

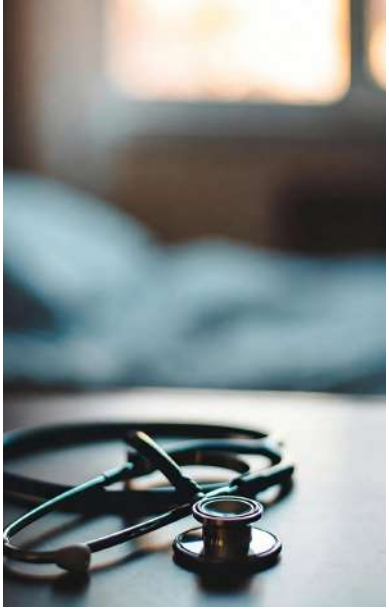
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ilmiy elektron jurnali O‘zbekiston Respublikasi Axborot va ommaviy kommunikatsiyalar agentligi (AOKA) tomonidan 2024-yil 9-oktabrdan boshlab c-5669651 raqami ostida rasmiy ro‘yxatdan o‘tkazilgan.

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MUNDARIJA

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ORGANISATIONAL MODEL OF DENTAL SUPPORT FOR PATIENTS WITH ORAL MUCOSAL CANCER: STAGE-BASED ALGORITHMS, DIGITAL SALIVARY PH MONITORING AND QUALITY-OF-LIFE OUTCOMES



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Abstract: In Uzbekistan, patients with oral mucosal cancer are referred late, and dental care during and after oncological treatment lacks a defined pathway. We substantiated an organisational model that includes stage-based dental algorithms, digital remote monitoring of salivary pH by the patients themselves and a dental support centre at the oncology dispensary, and evaluated it in 79 patients with extended dental support compared with 162 patients under standard follow-up, with quality of life assessed in a series of 320 patients. At 12 months, salivary pH remained at 6.0 or above in 100% of the main group versus 21.0% of the comparison group ($p<0.001$), ECOG 0 status was more frequent with dental support (45% vs 31%; $p=0.02$), and the OHIP-14 score for everyday life improved from 15.92 to 12.22. The model keeps the oral environment stable and improves quality of life, which justifies establishing dental support centres at oncology dispensaries.

Key words: oral mucosal cancer; dental support; organisation of care; salivary pH; remote monitoring; quality of life.

Annotatsiya: O‘zbekistonda og‘iz bo‘shlig‘i shilliq qavati saratoni bilan og‘rigan bemorlar kech yo‘naltiriladi, onkologik davolash davomida va undan keyin stomatologik yordam esa aniq tartibga ega emas. Bosqichli stomatologik algoritmlar, so‘lak pH ko‘rsatkichini bemorlarning o‘zi tomonidan raqamli masofaviy kuzatish va onkologik dispanser qoshidagi stomatologik qo‘llab-quvvatlash markazini o‘z ichiga olgan tashkiliy model asoslandi va kengaytirilgan stomatologik

hamrohlik olgan 79 bemorda standart kuzatuvdagi 162 bemorga nisbatan baholandi, hayot sifati esa 320 bemordan iborat seriyada o‘rganildi. 12 oydan so‘ng so‘lak pH 6,0 va undan yuqori darajada asosiy guruhning 100 foizida, taqqoslash guruhining 21,0 foizida saqlandi (p<0,001), ECOG 0 holati stomatologik hamrohlikda ko‘proq uchradi (45% va 31%; p=0,02), OHIP-14 bo‘yicha kundalik hayot ko‘rsatkichi esa 15,92 dan 12,22 gacha yaxshilandi. Model og‘iz bo‘shlig‘i muhitini barqaror saqlaydi va hayot sifatini yaxshilaydi, bu esa onkologik dispanserlar qoshida stomatologik qo‘llab-quvvatlash markazlarini tashkil etishni asoslaydi.

Kalit so‘zlar: og‘iz bo‘shlig‘i shilliq qavati saratoni; stomatologik hamrohlik; yordamni tashkil etish; so‘lak pH; masofaviy monitoring; hayot sifati.

Аннотация: В Узбекистане больные раком слизистой оболочки полости рта направляются поздно, а стоматологическая помощь во время и после онкологического лечения не имеет чёткого маршрута. Обоснована организационная модель, включающая поэтапные стоматологические алгоритмы, цифровой дистанционный мониторинг pH слюны самими больными и центр стоматологической поддержки при онкологическом диспансере; модель оценена у 79 больных с расширенным стоматологическим сопровождением в сравнении со 162 больными при стандартном наблюдении, а качество жизни изучено в серии из 320 больных. Через 12 месяцев pH слюны 6,0 и выше сохранялся у 100% больных основной группы против 21,0% группы сравнения (p<0,001), статус ECOG 0 чаще отмечался при стоматологическом сопровождении (45% против 31%; p=0,02), а показатель OHIP-14 «повседневная жизнь» улучшился с 15,92 до 12,22. Модель стабилизирует среду полости рта и улучшает качество жизни, что обосновывает создание центров стоматологической поддержки при онкологических диспансерах.

Ключевые слова: рак слизистой оболочки полости рта; стоматологическое сопровождение; организация помощи; pH слюны; дистанционный мониторинг; качество жизни.

INTRODUCTION

Oral cancer remains a significant problem worldwide and in Uzbekistan, where most patients are diagnosed at stages III–IV [1], [2]. In modern oncology, cure means not only survival but also an acceptable quality of life. For patients with oral mucosal cancer, quality of life depends heavily on the state of the mouth: mucositis, xerostomia, radiation caries and osteoradionecrosis can persist for months and years after treatment [3], [4], [5], [6]. International practice therefore embeds a dentist in the head and neck oncology team, with defined tasks before, during and after treatment [3], [7]. In Uzbekistan, such a structure is not yet in place: there are no specialised dental rooms or beds at oncology dispensaries and no approved programme of dental support, and patients are treated in the general dental network by dentists without training in oncology-related oral care [8].

Between visits, the oral environment can deteriorate unnoticed. Radiation reduces salivary flow and buffering capacity and shifts salivary pH toward acidic values, which promotes demineralisation, candidiasis and mucosal inflammation [4], [9], [10]. Systematic patient-reported symptom monitoring has been shown in a randomised trial to improve outcomes in oncology [11], and salivary pH can be measured by the patient with simple test strips. Combining these approaches could give the dentist an early warning signal between scheduled visits. The aim of this study was to substantiate an organisational model of dental support for patients with oral mucosal cancer and to evaluate its effect on salivary pH and quality of life.

LITERATURE REVIEW

Late effects of head and neck radiotherapy include permanent loss of saliva, osteoradionecrosis, dental caries, fibrosis and impaired wound healing, which require life-long management strategies [5]. Sroussi et al. and Epstein et al. therefore recommend including experienced oral health professionals in the oncology team and coordinating care through integrated multidisciplinary teams from diagnosis to survivorship [4], [3]. Nevertheless, a consensus protocol for oral management has not been established [7], and the ISOO-MASCC-ASCO guideline on osteoradionecrosis had to rely on informal consensus for some of its recommendations [6].

Salivary changes are central to late dental morbidity. Salivary gland hypofunction after radiotherapy depends on the cumulative dose to the glands and, unlike chemotherapy-induced changes, is often permanent [9]. Many interventions for xerostomia have been proposed, including saliva substitutes and stimulants, muscarinic agonists, intensity-modulated radiotherapy, photobiomodulation and acupuncture, but none is approved as definitive and the supporting evidence remains limited [10]. Simple indicators of the oral environment that patients can monitor themselves are therefore of practical interest.

Remote symptom monitoring is supported by strong evidence in general oncology. In a randomised trial of 766 patients receiving chemotherapy, self-reporting of symptoms with alerts to nurses improved health-related quality of life in 34% vs 18% of patients, reduced emergency room visits (34% vs 41%) and kept patients on chemotherapy longer (8.2 vs 6.3 months) [11]. For oral health outcomes, OHIP-14 is a validated short

instrument that explains 94% of the variance of the full OHIP-49 and has high internal reliability (Cronbach's alpha 0.88) [12]. Nutritional status, another indicator of quality of life, is often impaired at diagnosis and worsens during chemoradiotherapy [13]. In Uzbekistan, oral cancer is mainly diagnosed at advanced stages [2], and the rehabilitation of patients with maxillofacial tumours and defects requires a comprehensive approach that includes dental and prosthetic care [8]. However, an organisational model of dental support that combines stage-based algorithms, digital monitoring of the oral environment and a dedicated service at oncology dispensaries has not yet been described.

RESEARCH METHODOLOGY

Setting and design. The study was carried out at the Tashkent Regional Branch of the Republican Specialised Scientific-Practical Medical Centre of Oncology and Radiology and Tashkent City Dental Polyclinic No. 7. It combined an analysis of patient pathways, a prospective evaluation of digital salivary pH monitoring with a historical comparison group, and an assessment of functional status and quality of life. All patients had squamous cell carcinoma of the oral mucosa and received combined or multimodal treatment. The study followed the Declaration of Helsinki; all patients gave written informed consent. Salivary pH monitoring. The main group comprised 80 patients treated in 2024–2025 who received extended dental support (professional hygiene with Airflow air polishing, a protective mouthguard during radiotherapy and digital follow-up); 79 complete series of measurements were available. The comparison group comprised 162 patients treated in 2021–2023 and followed up according to the standard scheme. Salivary pH was measured in unstimulated whole saliva with indicator test strips at the same time of day, 1–2 hours after the last meal, tooth brushing or rinsing.

For the outpatient stage, an electronic observation form was set up in Google Sheets. Patients were trained to enter their pH values three times a week. A value of 5.5 or lower, or the appearance of dryness, burning, pain, coating or signs of mucosal inflammation, was a signal to contact the attending dentist immediately. Control points in the main group were before oral sanitation, after sanitation, after the main treatment and at 1, 3, 6 and 12 months; in the comparison group, after the main treatment and at 1, 3, 6 and 12 months. A pH of 6.0 or higher was taken as the target range and 5.5 or lower as critical. Functional status and quality of life. These were assessed in a clinical series of 320 patients: 196 who received the full set of dental measures at all stages of treatment and 124 who declined them. Functional status was graded by the Karnofsky index [14] and the ECOG scale [15]. Oral health-related quality of life was measured with OHIP-14 [12] in three domains — everyday life, chewing and ability to communicate — with answers scored from 5 (very often) to 1 (never), so that a lower score means a better quality of life. Measurements were taken before treatment and 2 months after its completion. Statistical analysis. Results are presented as M±SD or M±SEM. Between-group differences in pH were assessed with the Mann–Whitney U test and within-group changes with the Wilcoxon signed-rank test. Proportions were compared with Pearson's χ^2 test. Differences were considered significant at $p<0.05$.

ANALYSIS AND RESULTS

Patient pathway. Before reaching the oncology centre, 38.6% of patients had first consulted a dentist, 34.4% an ENT specialist and 19.5% a general surgeon, and 59.2% had treated themselves. Non-oncological treatment or self-treatment lasted 1–3 months in 42.4% of patients, 4–6 months in 38.6% and up to a year in about one-fifth. All patients who completed combined or multimodal treatment had changes in the oral mucosa or bone; erosive-ulcerative lesions were most frequent in patients with diabetes mellitus (26.1%), and complications after sanitation occurred mainly in patients with leucocyte counts of 3.0×10^9/L or lower. After risk assessment and preventive measures were introduced, bleeding after dental procedures fell from 8.0% to 5.0% and local inflammation in the procedure area within 1–3 days from 12.0% to 3.0% ($p<0.05$). Salivary pH. Sanitation alone raised the mean pH in the main group from 6.11±1.12 to 6.44±0.48 ($p<0.001$). Immediately after the main treatment, pH was similar in both groups, but from the first month onward it remained in the target range in the main group and fell toward acidic values in the comparison group (Table 1).

Table 1. Salivary pH during follow-up, M±SD

Time point	Main group (n=79)	Comparison group (n=162)	p
Before sanitation	6.11±1.12	—	—
After sanitation	6.44±0.48	—	—
After main treatment	6.32±0.56	6.35±1.24	0.002
1 month	6.55±0.46	5.83±0.83	<0.001

Time point	Main group (n=79)	Comparison group (n=162)	p
3 months	6.23±0.55	5.99±0.85	0.005
6 months	6.63±0.39	5.61±0.38	<0.001
12 months	6.38±0.40	5.84±0.78	<0.001

At 12 months the target range (pH ≥6.0) was maintained in all 79 patients of the main group but in only 34 (21.0%) of the comparison group, while critical values (pH ≤5.5) were found in none vs 128 (79.0%) patients (Table 2).

Table 2. Patients in the target (pH ≥6.0) and critical (pH ≤5.5) ranges, n (%)

Time point	Main: pH ≥6.0	Comparison: pH ≥6.0	Main: pH ≤5.5	Comparison: pH ≤5.5
After main treatment	68 (86.1)	57 (35.2)	11 (13.9)	105 (64.8)
1 month	79 (100)	31 (19.1)	0	131 (80.9)
3 months	59 (74.7)	74 (45.7)	20 (25.3)	88 (54.3)
6 months	78 (98.7)	22 (13.6)	1 (1.3)	140 (86.4)
12 months	79 (100)	34 (21.0)	0	128 (79.0)

Functional status. After treatment, ECOG 0 was more frequent in patients with full dental support (88; 45% vs 38; 31%), whereas ECOG 2 was more frequent without it (28; 14% vs 29; 23%) (χ^2, p=0.02). Karnofsky scores showed the same direction without a significant difference (p=0.32). The distribution of patients by both scales is shown in Table 3.

Table 3. Functional status after treatment, n (%)

Scale	Dental support (n=196)	No dental support (n=124)
Karnofsky 90	82 (42)	42 (34)
Karnofsky 80	41 (21)	21 (17)
Karnofsky 70	43 (22)	34 (27)
Karnofsky 60	18 (9)	17 (14)
Karnofsky 50	12 (6)	10 (8)
ECOG 0	88 (45)	38 (31)
ECOG 1	80 (41)	57 (46)
ECOG 2	28 (14)	29 (23)

Oral health-related quality of life. Baseline OHIP-14 scores were similar in the two groups. Two months after treatment, scores improved in all three domains with dental support but changed little without it (Table 4).

Table 4. OHIP-14 domain scores before and 2 months after treatment, M±SEM

Domain	Support: before	Support: after	No support: before	No support: after
Everyday life	15.92±0.75	12.22±0.57	15.96±0.59	14.03±0.41
Chewing	8.96±0.59	7.12±0.34	8.97±0.22	8.10±0.54
Ability to communicate	10.11±0.58	7.59±0.45	10.12±0.16	9.96±0.59

Organisational model. On the basis of these results, a three-stage algorithm of dental support was developed: 1. Before treatment: tumour board with a dentist; dental examination and an individual support plan; replacement of metal prostheses with acrylic ones; professional hygiene; replacement of metal fillings; extraction of non-restorable teeth; remineralisation and resin infiltration of early carious lesions; patient education. 2. During chemoradiotherapy: prevention of mucositis (hygiene kit, protective mouthguards), xerostomia (protective devices, individual irradiation planning) and caries (remineralisation, infiltration); treatment of acute odontogenic infection, mucositis and candidiasis; for grade IV mucositis, a break in treatment with inpatient therapy. 3. After treatment: dispensary follow-up with digital salivary pH monitoring; treatment of xerostomia and radiation caries; inpatient treatment of osteoradionecrosis; prosthetic rehabilitation by gentle methods. To implement the algorithm, we propose a dental support centre at each oncology dispensary, staffed by a

dentist trained in oncology-related care and a prosthodontist, with 1–2 beds for patients with persistent oral complications. Its functions are: 1. Participation of the dentist and prosthodontist in the treatment plan of every patient with newly diagnosed cancer. 2. Recommendations for dispensary follow-up and outpatient dental care after discharge. 3. A staged rehabilitation plan, including prosthetics. 4. Fabrication and fitting of individual protective devices for radiotherapy. 5. Fabrication of obturators and other devices to restore bone defects after maxillofacial surgery. 6. Training seminars on dental and interdisciplinary care for staff of municipal polyclinics. 7. Methodological materials on oral and dental care for general dentists and for patients.

The study shows that dental support for patients with oral mucosal cancer works best as an organised, continuous process rather than a one-time sanitation. A tumour board that includes a dentist, a fixed algorithm for each stage of treatment and a clear point of contact after discharge correspond to international recommendations on oral care in head and neck oncology [3], [7], [6]. Digital salivary pH monitoring added an inexpensive feedback channel. Over 12 months, the main group stayed in the target range, while the comparison group drifted toward acidic values, with 79% of patients in the critical range at 12 months. An acidic oral environment after radiotherapy reflects reduced salivary flow and buffering and favours demineralisation, candidiasis and inflammation [9], [10]. Self-measurement and an online form turned pH from a passive record into a trigger for action, in the same way that patient-reported symptom monitoring improves outcomes in general oncology [11]. The temporary fall at 3 months (74.7% in the target range) indicates that this period needs particular attention. The monitoring tool required no special equipment: indicator strips and a free online spreadsheet were sufficient, which makes the approach feasible in regional oncology dispensaries. At the same time, strips are semi-quantitative, and for research purposes, electronic pH meters combined with measurement of salivary flow rate would provide more precise data [9].

Patients with dental support more often returned to full activity (ECOG 0), gained weight and reported better everyday functioning and communication on OHIP-14 [12]; the weight gain is relevant because nutritional status is often impaired after chemoradiotherapy [13]. Late complications of radiotherapy, especially osteoradionecrosis, may appear months or years later [5], [6], so long-term dispensary follow-up by a trained dentist and prosthodontist is essential [8]. The proposed dental support centre would close the main organisational gap because, at present, the oncology dispensaries of the country have no dedicated dental rooms, beds or programmes for these patients. Concentrating preventive care, protective devices, prosthetic rehabilitation and training of general dentists in one unit is likely to reduce late complications and the subsequent costs of treatment and prosthetics, as shown for multidisciplinary oral care in head and neck oncology [3], [7]. Limitations. The pH comparison group was historical, and pH was measured semi-quantitatively with test strips. Quality of life was assessed in a non-randomised series, and only three OHIP-14 domains were reported. A prospective multicentre evaluation of the model is needed.

CONCLUSION

Late referral after self-treatment and non-oncological care is typical for patients with oral mucosal cancer and requires a defined interdisciplinary pathway with a dentist on the tumour board. A three-stage algorithm of dental support and a dental support centre at each oncology dispensary form a practical organisational model. Digital self-monitoring of salivary pH kept the oral environment in the target range: at 12 months pH ≥6.0 was maintained in 100% vs 21.0% of patients ($p<0.001$). Dental support was associated with better functional status (ECOG 0: 45% vs 31%; $p=0.02$) and improved OHIP-14 scores for everyday life (15.92 → 12.22) and communication (10.11 → 7.59). Conflict of interest. The authors declare no conflict of interest. Funding. The study received no external funding.

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