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10. სტატიის შედეგზე უნდა შეიყვანო სახმარო, თემატიკა, გამოყოფილი შედეგი შეიყვანო;

11. ხის ხალახში უნდა შეიყვანო ხის ხალახი მოხვლე შედეგით, სახმარო – ლიტერატურა ქრონიკა.

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დოკუმენტული შეტყობინების გადაწყვეტა სპეციფიკები: სტატიები ბუნებრივი. განთავსებული გამოყოფილი სახეობები არ გამოყოფილი შედეგი.
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Nino Chomakhashvili, Nino Chikhladze, Nato Pitskhelauri.
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Abstract.

The dental profession is associated with occupational health problems. The working environment of a dentist is associated with ergonomic risk factors that can significantly reduce the dentist's working ability and even cause the termination of his/her professional activity. Numerous studies have been conducted in different countries (Sweden, Denmark, Germany, Poland, Australia, etc.) to assess the prevalence of musculoskeletal disorders in dentists, though no studies related to the principles of ergonomics in dentistry have been carried out in Georgia.

Aim: The study aimed to assess the ergonomic environment of dentists in Tbilisi (capital city of Georgia) clinics and to identify the prevalence of musculoskeletal disorders among them.

Methods: An observational descriptive study was conducted in April-July 2023 in Tbilisi. A special questionnaire of 40 questions was designed based on international experience. The survey was conducted by random sampling in selected dental clinics. Dentists were asked to fill out the questionnaire during their free time between patient appointments. Those who agreed to participate were provided with electronic versions of the questionnaire.

Results: Five hundred dentists were invited to participate in the survey, of whom 314 (62.8%) agreed to fill out the questionnaire. A total of 291 fully completed questionnaires were used for the descriptive statistical analysis. Our study shows that in Tbilisi clinics dentists work on average for 5-6 days (48.8% - 6 days, 37.1% - 5 days) or 40-48 hours a week. A majority of respondents said their workplace met the requirements of ergonomics (it had a good lighting, the chair had a back, instruments could be easily reached), yet most of them rarely lean on the backrest, never or rarely use the hand rest method, and never or rarely do light physical exercise during breaks.

The survey shows that 53.6% of dentists most frequently suffer from pain in the back, followed by pain in the neck (50.9%), shoulders (47.9%) and lower back (47.1%). Most of them said they had to work less because of the pain.

Conclusion: Introduction of the principles of ergonomics in dental profession is vital for preventing occupational musculoskeletal disorders. It is important to provide continuing professional development programs and information booklets for dentists and thematic online webinars for the management of dental clinics in Georgia.

Key words. Dentistry, ergonomics, dental practice, musculoskeletal disorders, dental practice in Georgia, ergonomics in Georgia.

Introduction.

The dental profession is associated with occupational health problems. The working environment of a dentist is associated with ergonomic risk factors that can significantly reduce the dentist's working ability and even cause the termination of his/her professional activity.

Musculoskeletal disorders, including discomfort, sporadic muscle pain, and muscle tension, can be observed in dentists both in the initial stages of professional activity and during long-term clinical practice. These disorders are usually ignored until they lead to functional limitations.

Ergonomic risk factors associated with dental profession include working in an incorrect posture, prolonged static standing or sitting, unsupported sitting, repetitive mechanical movements, forceful work, vibration of hand instruments, improper lighting, lack of magnifying devices, etc. [1-3]. Ignoring ergonomic risk factors can affect muscles, tendons, blood vessels and nerves, leading to increased complaints and decreased productivity [4]. The most common body regions affected by pain due to musculoskeletal disorders in dentists are back, lower back, neck, fingers, shoulders, and legs [5-8].

Physical pain ergonomics aims to identify and mitigate factors that contribute to discomfort or musculoskeletal injuries associated with professional practice. Dentists' physical pain ergonomics focuses specifically on the ergonomic principles applied to the dental profession to minimize discomfort and reduce the risk of musculoskeletal injuries among dental practitioners. Dentists often experience physical strain due to prolonged periods of sitting, repetitive motions, and awkward body positions required during dental procedures. By prioritizing physical pain ergonomics, dentists can maintain their health and longevity in their profession while delivering quality dental care to their patients.

Numerous studies, conducted in different countries (Sweden, Denmark, Germany, Poland, Australia, etc.) to assess the prevalence of musculoskeletal disorders in dentists, show the global prevalence between 64 to 93% [9-12]. No studies related to the principles of ergonomics in dentistry have been carried out in Georgia.

According to the National Centre for Disease Control and Public Health of Georgia (NCDC), in 2022, 585 dental clinics were operating in Georgia, including 216 clinics in Tbilisi (the capital city). In the same year, there were 3,964 dentists working throughout the country, of which 2,530 were working in Tbilisi.

The study aimed to assess the ergonomics of the working environment of dentists in Tbilisi and to identify the prevalence of musculoskeletal disorders among them.

Methods.

An observational descriptive study was conducted in April-July 2023 in Tbilisi. A special questionnaire of 40 questions was designed based on international experience [13-15]. The questions were related to the demographic data of the respondents, workplace ergonomic practices (posture, lighting, etc.), respondents’ understanding of the ergonomic principles and their experience of musculoskeletal disorders.
The questionnaire was piloted with 10 dentists working in the University's Department of Dentistry. Only minor technical details were corrected after the piloting. Questions were rated on a 5-point Likert scale (never-1; rarely-2; sometimes-3; often-4; always-5).

The survey was conducted by random sampling in selected dental clinics. Dentists were asked to fill out the questionnaire during their free time between patient appointments. Those who agreed to participate, were provided with electronic versions of the questionnaire. The survey was conducted on conditions of anonymity with approval of the NCDC Ethics Committee (protocol no. 2023-031).

Results.

Five hundred dentists were invited to participate in the survey, of whom 314 (62.8%) agreed to fill out the questionnaire. A total of 291 fully completed questionnaires were used for the descriptive statistical analysis.

As to the gender and age composition of the survey participants, 219 (75.3%) of them were female and 72 (24.7%) were male; 74.7% were in the age group of 35-54 years, including 23% of 35-39 years, 18.3% of 50-54 years, 17.9% of 40-44 and 15.5% of 45-49 years.

53.3% of the respondents specialized in therapy, 20.3% in orthopedics, and 16.2% in surgery; 33% of them had 11-20 years’ experience in profession, 24.7% had more than 21 years, 20.6% had 6-10 years, and 13.7% had 2-5-years’ experience. At their last place of employment, 27.5% of respondents have worked for 2-5 years, 24.7% have worked for 6-10 years and 1 year, 19.6% have worked for 11-20 years, and 3.2% have worked for 21 years or more. Almost half of the respondents (48.8%) had a 6-day work week and 37.1% had a 5-day work week, while 14.1% did not answer the question (see Table 1).

As per the findings, the average number of working hours per day is 8, although some dentists (n=126) work more than 8 hours: 5 named the longest working day of 12 hours, 3 respondents work for 11 hours, 100 work for 10 hours and 18 work for 9 hours a day. Dentists see an average of 7 patients per day, although some of them (n=55) see 8 or more patients.

According to 57.7% of respondents, they mostly sit while working, 30.6% sit or stand in turns, and 11.7% mostly stand. As regards patient positioning, 50.9% of them said they preferred supine position, 44.3% mentioned semi-sitting and 4.8% - upright position; 90% of respondents said they had good lighting at their workplace, while 10% answered in the opposite; 86.6% of dentists can easily reach their instruments, while 13.4% cannot; 98.3% them said that their chair had a back, 0.7% said it had not; 61.5% of dentists rarely lean on the back while working, 21.6% do it often, and 16.8% never do it; 38.1% of them never use the hand rest and 43.3% do it rarely (i.e. a total of 81.4%), while 13.7% use the hand rest often and 4.9% do it always; 54.4% of dentists rarely take a 10-minute break between patient appointments, 28.1% do it often, 23.7% do it always, and 2.7% never do it; 62.9% of dentists never do light physical exercise during breaks, 28.5% do it rarely, and 8.6% do it often.

The survey showed that 26.5% of respondents do regular physical activity (walking, running, swimming, etc.) and 1-2 times a month outside of work hours, 21.0% do it once a week, 21.6% do it 2 times a week, and 33% do it 3 times a week. On average, 42.3% of respondents spend 60 minutes, 32.3% spend 30 minutes, 15.8% spend less than 15 minutes and 9.6% spend more than an hour for physical activity.

In the past 12 months, 53.6% of dentists reported the most frequent pain syndrome in the back, neck (50.9%), shoulders (47.9%) and lower back (47.1%). About a quarter of them also reported frequent pain in the finger bones, and a fifth complained of pain in the wrist (see Table 2). According to 32.3% of respondents, they experienced pain for more than one month in the last 12 months, due to which 78.7% of them had to work less, 4.5% had to miss the work, 22.7% had to consult a doctor, and 38.5% had to undergo medical treatment; 57.7% of respondents had experienced pain in the above regions in the last 7 days.

### Table 1. Characteristics of the study population (n = 291).

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>219</td>
<td>75.3%</td>
</tr>
<tr>
<td>Male</td>
<td>72</td>
<td>24.7%</td>
</tr>
<tr>
<td>Age Groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35 and older</td>
<td>217</td>
<td>74.7%</td>
</tr>
<tr>
<td>Younger than 35</td>
<td>74</td>
<td>25.3%</td>
</tr>
<tr>
<td>Specialty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Therapy</td>
<td>155</td>
<td>53.3%</td>
</tr>
<tr>
<td>Orthopedics</td>
<td>59</td>
<td>20.3%</td>
</tr>
<tr>
<td>Surgery</td>
<td>47</td>
<td>16.2%</td>
</tr>
<tr>
<td>Other</td>
<td>30</td>
<td>10.2 %</td>
</tr>
<tr>
<td>Experience in profession</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 10 years</td>
<td>168</td>
<td>57.7%</td>
</tr>
<tr>
<td>Less than 10 years</td>
<td>123</td>
<td>42.3%</td>
</tr>
<tr>
<td>Number of patients per day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 patients and more</td>
<td>55</td>
<td>18.9%</td>
</tr>
<tr>
<td>Less than 8 patients</td>
<td>236</td>
<td>81.1 %</td>
</tr>
<tr>
<td>Working hours per day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8h</td>
<td>61</td>
<td>20.9%</td>
</tr>
<tr>
<td>More than 8h</td>
<td>126</td>
<td>43.3%</td>
</tr>
<tr>
<td>Less than 8h</td>
<td>104</td>
<td>35.8%</td>
</tr>
</tbody>
</table>

### Table 2. The affected body regions and frequency of pain.

<table>
<thead>
<tr>
<th>Body region</th>
<th>Frequency of pain</th>
<th>Seldom (n-%)</th>
<th>No pain (n-%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
<td>148(50.9%)</td>
<td>90(30.9%)</td>
<td>53(18.2%)</td>
</tr>
<tr>
<td>Shoulder</td>
<td>139(47.9%)</td>
<td>99(31.6%)</td>
<td>53(18.2%)</td>
</tr>
<tr>
<td>Back</td>
<td>156(53.6%)</td>
<td>87(29.9%)</td>
<td>48(16.5%)</td>
</tr>
<tr>
<td>Finger bones</td>
<td>71(24.4%)</td>
<td>77(26.5%)</td>
<td>143(49.1%)</td>
</tr>
<tr>
<td>Wrist</td>
<td>61(21.0%)</td>
<td>89(30.6%)</td>
<td>141(48.5%)</td>
</tr>
<tr>
<td>Elbow</td>
<td>37(12.7%)</td>
<td>57(19.6%)</td>
<td>197(67.7%)</td>
</tr>
<tr>
<td>Lower back</td>
<td>137(47.1%)</td>
<td>104(35.7%)</td>
<td>50(17.2%)</td>
</tr>
<tr>
<td>Pelvis</td>
<td>55(18.9%)</td>
<td>82(28.2%)</td>
<td>154(52.9%)</td>
</tr>
<tr>
<td>Knee</td>
<td>45(15.5%)</td>
<td>92(31.6%)</td>
<td>154(52.9%)</td>
</tr>
<tr>
<td>Ankle cuff</td>
<td>34(11.7%)</td>
<td>58(19.9%)</td>
<td>199(68.4%)</td>
</tr>
<tr>
<td>Toe bones</td>
<td>29(10.0%)</td>
<td>46(15.9%)</td>
<td>216(74.1%)</td>
</tr>
</tbody>
</table>
The survey showed that 67.4% of respondents assess their health as poor, 7.9% as satisfactory, and 24.7% as good; 87.3% of them associate their health problems with their profession, and 97.3% of them believe that dentist's profession is associated with health risks. According to 92.8% of respondents, it is important to consider the principles of ergonomics in daily activities to prevent occupational diseases.

It is noteworthy that 99.7% of respondents said they would like to improve their knowledge regarding ergonomics and prevention of occupational diseases through: participation in continuous professional development programs (61.5%), information booklets (12.0%) and online webinars (26.6%).

**Discussion.**

According to scientific literature, dentists work on average for 4-5 days (35-40 hours) a week. Our study shows that in Tbilisi clinics dentists work on average for 5-6 days (48.8% - 6 days, 37.1% - 5 days) or 40-48 hours a week. A majority of respondents said their workplace met the requirements of ergonomics (it had a good lighting, the chair had a back, instruments could be easily reached), yet most of them rarely lean on the backrest, never or rarely use the hand rest method, and never or rarely do light physical exercise during breaks. Maintaining overall physical fitness can enhance resilience to physical stress and reduce the risk of injuries. Engaging in regular exercise, such as strength training and cardiovascular workouts, can improve muscle strength, flexibility, and endurance. By prioritizing physical pain ergonomics, dentists can minimize discomfort, prevent injuries, and maintain their health and well-being throughout their careers.

Dentistry involves prolonged periods of sitting and performing intricate tasks with repetitive motions, which can lead to various musculoskeletal issues such as back pain, neck pain, shoulder pain, and carpal tunnel syndrome. The survey shows that 53.6% of dentists suffer from back pain, followed by pain in the neck (50.9%), shoulders (47.9%), and lower back (47.1%). They said they had to work less because of pain. A quarter of them rated their health as good, while the majority rated it as poor, and most of them consider their health problems to be occupational. The goal of ergonomics in dental practice is to prevent musculoskeletal disorders associated with occupation. There are various strategies available for physical pain ergonomics:

- Performing the same tasks repeatedly can lead to overuse injuries. Dentists should incorporate task variation into their workday to distribute physical strain more evenly across muscle groups. Alternating between different procedures or taking breaks to perform administrative tasks can help prevent overuse injuries.
- Magnification devices, such as loupes or microscopes, can improve visualization during procedures, reducing the need for awkward postures. Proper lighting is also essential for reducing eye strain and maintaining visibility.
- Taking regular breaks during the workday allows dentists to rest and relieve muscle tension. Stretching exercises can help improve flexibility and reduce the risk of musculoskeletal injuries. Dentists should incorporate stretching routines into their daily schedule to promote physical well-being.
- Participation in continuing professional development programs is essential for dentists to understand the principles of ergonomics. Dentists and dental staff should receive training on proper ergonomic techniques and injury prevention strategies. Education on body mechanics, lifting techniques, and workstation setup can help raise awareness of potential risk factors and promote safe work practices.

The results of our survey showed that the majority of respondents considered it important to know and follow the principles of ergonomics in their daily work, and they were interested in improving their knowledge and awareness in this area.

The study limitation. The study's applicability to broader contexts is limited since it focused solely on dental clinics within the capital city. To validate the broader relevance of the findings, further research should encompass diverse settings.

**Conclusion.**

Introduction of the principles of ergonomics in dental profession is vital for preventing occupational musculoskeletal disorders. It is important to provide continuing professional development programs and information booklets for dentists and thematic online webinars for the management of dental clinics in Georgia.

**REFERENCES**


**Эргономическая практика в стоматологических клиниках и заболевания опорно-двигательного аппарата у врачей-стоматологов в Грузии**

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**Тбилисский государственный университет имени Ивана Джавахишвили**

**Абстракт**

Рабочая среда врача-стоматолога связана с эргономическими факторами риска, которые могут существенно снизить трудоспособность врача и даже стать причиной прекращения профессиональной деятельности. В разных странах (Швеция, Дания, Германия, Польша, Австралия и др.) проведены многочисленные исследования по оценке распространенности нарушений опорно-двигательного аппарата у врачей-стоматологов. В Грузии исследований, связанных с принципами эргономики в стоматологии, не проводилось.

Целью настоящего исследования является оценка состояния эргономики клинической рабочей среды врачей-стоматологов, работающих в стоматологических клиниках города Тбилис, и выявление частоты нарушений опорно-двигательного аппарата среди них.

**Методика исследования**

Наблюдательное описательное исследование было проведено в апреле-июле 2023 года в Тбилис. Для опроса была подготовлена специальная анкета. Исследование проводилось по принципу случайной выборки в выбранных стоматологических клиниках. Врачам-стоматологам предложили заполнить анкету в свободное время между приемами пациентов. В случае согласия врачу предоставлялась онлайн-версия анкеты.

**Результаты**

К участию в исследовании были приглашены 500 стоматологов, 314 (62,8%) из которых согласились заполнить анкету. Для описательного статистического анализа была использована 291 полностью заполненная анкета.

По результатам исследования на примере тбилисских клиник клиническая деятельность стоматологов составляет в среднем 5-6 дней в неделю (48,8% стоматологов работают 6 дней, 37,1% - 5 дней), а количество рабочих часов составляет 40-48 часов.

Для большинства респондентов рабочая обстановка в клинике соответствует требованиям эргономики (хорошее освещение на рабочем месте, кресло со спинкой, инструменты легко доступны), однако большая часть респондентов редко опирается на спинку, никогда или редко использует метод опоры для рук, не выполняет или редко выполняет легкие физические упражнения во время перерывов.

Согласно результатам исследования, 53,6% стоматологов чаще всего жаловались на боли в спине, далее следуют шея (47,9%), плечи (47,9%) и поясничный отдел (47,1%). По их словам, им приходилось ограничивать рабочий процесс из-за боли.

**Выводы**

Внедрение принципов эргономики в стоматологической профессии жизненно необходимо для предотвращения профессиональных заболеваний опорно-двигательного аппарата. Важно разработать программы непрерывного профессионального развития и информационные буклеты для стоматологов, а также проводить тематические онлайн-вебинары для руководства стоматологических клиник в Грузии.