Aims and Objectives: Common conditions of daily routine and diet may affect the dental status of individuals in organized groups and professional communities. The aim of this study was to reveal the specific aspects of dental status in orthodox priests and monks of the Yaroslavl region, Russia.

Materials and Methods: Dental assessment of 311 participants (111 monks; 111 priests; and 90 local residents, not clergymen – as a control group) was performed, including Decayed, Missed, Filled Teeth, oral hygiene index (simplified), gingival, and Modified Papillary Bleeding Indices (MPBIs). The participants completed a questionnaire on food habits and awareness concerning dental health preservation.

Statistical Analysis Used: Statistical analysis of the data was performed in SPSS software with the use of Shapiro–Wilk, Dunn’s, Fisher tests, z-test as well as Spearman correlation, and ANOVA.

Results: The median values of MPBI in monks were higher than in the groups of priests and local residents (P = 0.005). The differences in number of missing teeth were significantly higher in priests compared with local residents (P = 0.011), and the number of filled teeth was significantly higher in priests (P = 0.006) and local residents (P = 0.007) compared with monks. Wedge-shaped defects and erosions were more prevalent in the groups of priests (0.0018 and 0.001, respectively) and monks (0.004 and 0.001, respectively). ANOVA resulted in statistically significant influence of teeth brushing frequency and frequency of food intake on hygienic and periodontal indices values.

Conclusions: The increased prevalence of some dental diseases among priests and monks could be attributed to the specific diet, lifestyle, and limited access to dental care.

Keywords: Dental status, oral hygiene habits, orthodox Christians

INTRODUCTION

The aim of the present study was to identify the specific aspects of dental status among orthodox clergymen in the Yaroslavl region of the Russian Federation and to link them to specific conditions of their lifestyle.

Christianity is the world’s largest religion, with over 2.4 billion followers (33% of the global population) known as Christians. They make up most of the citizens in about two-thirds of the countries and territories in the world. The three primary divisions of Christianity are Catholicism, Orthodoxy, and Protestantism. In the Russian Federation, the orthodox clergy is an important social group, including more than 100,000 people. According to the Russian Public Opinion Research Center (VCIOM), there are more than 40,000 orthodox priests and up to 70,000 monks and 926 working orthodox monasteries.

The lifestyle of priests and monks implies the alteration of the nutrition regimen and composition of food

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during fasting, and sometimes, living in far-off regions with poor availability of dental care. Recently, there has been a growth in the volume of scientific papers assessing the association between religion, spirituality, and health. Those previous studies demonstrated associations, although not universal, indicating the benefits from religious and spiritual involvement for some health outcomes.\textsuperscript{[3–8]} However, the number of publications concerning the association between religion and dental health is limited. In the study by Zini et al., the authors revealed positive effect of being religious on dental health among the Jewish population of Jerusalem due to healthier lifestyles, and negative views about tobacco, alcohol consumption, and drugs.\textsuperscript{[8]} By contrast, a study by Jain et al. showed that Jain monks have poor oral hygiene and an increased prevalence of periodontal disease compared to those of a similarly aged general population.\textsuperscript{[9]} To the best of our knowledge, no studies assessing the dental status of Orthodox priests and monks have been previously published.

\textbf{Materials and Methods}

Before starting the study, a permit was obtained from the interacademic ethical committee, Moscow (No. 09–16). A written consent was obtained from all the participants before the enrollment of the study.

A nonrandomized controlled cohort retrospective study was conducted among clergymen in the Yaroslavl region from September 2016 to September 2017. The study groups included the following:

- Group 1A – 111 monks, men
- Group 1B – 111 priests, men
- Group 2 – 90 local residents, men.

Monks – people who practice religious asceticism by monastic living, that is in the present study people who constantly lived in a monastery, were celibate (not married) and ate food that was cooked in the monastery.

Priests – people who were religious leaders authorized to perform the sacred rituals of a religion, in the present study, people, who were not residents of the monastery, could have families and ate food cooked at home.

\textbf{Inclusion criteria}

For all groups – age 44–65; Group 1A (monks) – residence in a monastery for at least 2 years.

\textbf{Exclusion criteria}

Noncontrolled systemic diseases, alcohol and drug abuse, refusal to participate in the study, and residency in the other regions were excluded in the study.

Clinical examination was carried out in a dental office in the Spaso-Yakovlevsky-Dmitriev Monastery in Rostov, the Great of the Yaroslavl Region. During the Soviet Union, this monastery was a prison, and for this reason, it had a dental office. However, this was not the norm and this case is an exception. A standard set of dental instruments was used for the examination. The examiner was blinded to the group to which the patient belonged. The hygienic status of each participant was assessed using a Simplified Index of Oral Hygiene (OHI-S) (Greene, Vermillion, 1964). The periodontal status of each participant was assessed using the gingival index (GI) (Loe H., Silness J., 1963). Modified Papillary Bleeding Index (MPBI) was used to assess the severity of periodontal inflammation (Barnett 1980, Muhlemann 1977). To determine the severity of caries, the Decayed, Missed, Filled Teeth (DMFT) index was used, representing the total number of teeth affected by caries (decay, D), teeth with fillings (F), and missing teeth (M). In addition to the clinical data, the information regarding dietary and oral care habits was obtained using questionnaires.

\textbf{Statistical analysis}

Statistical analysis of the data was carried out using the Statistical Software version 22 (SPSS Inc, Chicago, IL). The normality of parameter values distribution in studied groups was estimated using the Shapiro–Wilk test. We used to identify intergroup and intragroup differences and bilateral nonparametric tests. Comparison of the data between the groups (monks, priests, and local residents) on the same observation dates was performed using Dunn’s test (with alpha level 0.017 to adjust for multiple comparisons). Distribution homogeneity of patients with various nosological forms of oral disease was determined using the Fisher test and $z$-test, and we performed the Spearman correlation test to compare the questionnaire results between the groups. The strength of correlation relationship showed similarities between groups in relative number of people who chose the same response. ANOVA was used to assess the influence of various factors on the values of periodontal and hygienic indices.

\textbf{Results}

Results obtained from the questionnaire are shown in Table 1.

Clergymen mostly visited dentist less than once a year (20.5% and 33% for the groups of monks and priests, respectively), while the percentage of respondents who only visited the dentist when there was already a problem was extremely high in the clergymen groups (79.5% and 52% for monks and priests, respectively). Thirty-six percent of local residents visited the dentist twice a year, and 45% once a year.
According to the questionnaire, 23%, 69%, and 80% of the responders cleaned teeth twice a day in the groups of monks, priests, and local residents, respectively. Seventy-five percent of the monks only cleaned their teeth once a day, as they went for the morning service fasting. The use of dental floss was only reported in 1.1%, 3.27%, and 10% of cases in the groups of monks, priests, and local residents, respectively.

It was shown that most monks and priests (75% and 95%, respectively) ate twice a day, while 90% of local residents ate more often: 3 (45%) or 4–5 (45%) times a day. Solid food was on the menu 2–3 times a week in 88%, 91%, and 68.5% in groups of monks, priests, and local residents, respectively. According to the survey of the monastery cooks, drinks that monks consumed in the monasteries contained 2.5 teaspoons of sugar per 250 ml of liquid per meal (lunch, dinner). Thus, the monks consumed 195–260 g of sugar with drinks per day. During fasting, carbohydrate food (bakery, confectionery products) prevailed.

The Spearmen correlation analysis has shown that there was a strong positive correlation of the results of questionnaire between the groups of priests and monks and moderate correlation between the groups of priests and local residents [Table 2].

The data obtained from clinical examination

The prevalence and intensity of dental diseases

According to the results of dental status assessment in Groups 1A and 1B, the first five places among the identified diseases were the following: dental caries – K02 (97.2% and 91.8% in the study groups), other diseases of hard tooth tissues – K03 (82%, 8%, and 72%, respectively), pulp and periapical tissue diseases – K04 (52.2% and 45.9%, respectively), complete or partial tooth loss – K08.1 and K08.4 (51.3% and 39.6%, respectively), and gingivitis and periodontal disease – K05 (50.4% and 40.5%, respectively). In the control group, tooth decay K02 – 90.1%, other diseases of hard tooth tissues K03 – 68.5%, gingivitis and periodontal diseases K05 – 39.1%, diseases of pulp and periapical tissues K04 – 37.6%, and complete or partial tooth loss – K08.1 and K08.4 – 32%.

According to OHI-S index, the level of hygiene was low in patients from all groups [Table 3]. The median values of the GI in the study groups corresponded to severe gingivitis: in 1A group –1.7 (0; 2.1); in 1B group –2.1 (0; 2.2); and in group 2-1 (0; 2.1). There were no statistically significant differences between groups. The median values of MPBI in monks were higher than in the groups of priests and local residents: 2 (0; 3); 2 (0; 2.2); and 1.1 (0; 2.1), respectively. The differences between the groups of monks and priests were statistically significant ($P = 0.005$).

There were no statistically significant differences between groups in the median number of decayed

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### Table 1: The results of questionnaire

| Question                                           | Answers                  | 1A (monks) (%) | 1B (priests) (%) | 2 (local residents) (%) |
|----------------------------------------------------|--------------------------|----------------|------------------|------------------------|
| How often do you visit dentist for a prophylactic checkup? | Twice a year             | 0              | 0                | 36.5                   |
|                                                    | Once a year              | 0              | 15               | 45                     |
|                                                    | Less often than once a year | 20.5          | 33               | 18.5                   |
|                                                    | More often than twice a year | 0              | 0                | 1.96                   |
| How often do you clean your teeth?                 | Once a day               | 75             | 31               | 10                     |
|                                                    | Two times a day          | 23             | 69               | 80                     |
|                                                    | Once a week              | 0.45           | 0                | 0                      |
|                                                    | Only before visiting dentist | 1.35          | 0                | 0                      |
| Which means of individual hygiene do you use?      | Toothpaste               | 99             | 100              | 100                    |
|                                                    | Toothbrush               | 100            | 100              | 100                    |
|                                                    | Dental floss             | 1.1            | 3.27             | 10                     |
|                                                    | Dentifrice               | 1.84           | 9.53             | 20                     |
| How many times do you eat during the day?          | 1 time a day             | 25             | 5                | 0                      |
|                                                    | 2 times a day            | 75             | 95               | 10                     |
|                                                    | 3 times a day            | 0              | 0                | 45                     |
|                                                    | 4-5 times a day          | 0              | 0                | 45                     |
| How often do you consume hard food?                | Every day                | 0              | 0                | 24.5                   |
|                                                    | 2-3 times a week         | 88             | 91               | 68.5                   |

### Table 2: The correlation analysis (according to the Spearman correlation coefficient) for the results of questionnaire

|                      | $r$  | $P$       | Interpretation     |
|----------------------|------|-----------|--------------------|
| Monks and priests    | 0.85 | <0.001    | Strong correlation |
| Monks and local residents | 0.4  | 0.007    | Weak correlation   |
| Priests and local residents | 0.63 | <0.001 | Moderate correlation |
teeth [Table 4]. However, the difference in the number of missing teeth was significant between priests and local residents ($P = 0.011$), and the difference in the number of filled teeth was significant between monks and priests ($P = 0.006$) and monks and local residents ($P = 0.007$).

Wedge-shaped defects and erosions were also more often observed in the groups of priests (0.0018 and 0.001, respectively) and monks (0.004 and 0.001, respectively) compared with the group of local residents. However, no statistically significant differences were found between the groups in the numbers of teeth affected with attrition, teeth covered with artificial crowns, and teeth having mobility (Grade III). The number of teeth with pulpitis was significantly greater among monks compared to priests ($P < 0.001$) and local residents ($P = 0.015$).

**Periodontal status**

Table 5 shows the statistically significant effect of sweet food intake frequency ($P = 0.014$) on the GI index, and it also shows the tendency of toothbrushing frequency effect on the GI index value ($P = 0.067$). A similar association was found between MPBI and toothbrushing frequency ($P = 0.034$) as well as the frequency of food intake ($P = 0.001$).

**DISCUSSION**

The present study aimed to identify specific features of dental status among orthodox clergymen and reveals the specific conditions of their daily life which might impact their dental health. It has been shown that priests and monks had comparable dental and periodontal indices with the control group (local residents); however, we found a substantial lack of dental help for clergymen which resulted in a greater number of untreated teeth. Smaller median number of filled teeth and a greater median number of missing teeth as well as the teeth affected with erosions and wedge-shaped defects in groups of clergymen were found. According to the data obtained from the questionnaire, monks and priests rarely visited dentists for prophylactic checkups compared to the local residents. They also consumed food containing more carbohydrates with specific conditions of life that included low frequency of food intake and toothbrushing, which contributed to the high values of GI and MPBI.

Lifestyle may have a significant influence on the dental status of the individual. The prevalence of caries and plaque-induced periodontal diseases is associated with the quality of individual hygiene, frequency of food intake, motivation toward the preservation of oral health, and in some cases with religious commitment.

Orthodox monks spend from 5 to 10 h in churches and praying. It is important to note that they attend the morning service fasting and without brushing their teeth, which complicates daily oral hygiene procedures, and especially in the morning. According to the results of the questionnaire, 75% of monks and 31% of priests cleaned teeth once a day, and only 1.1% and 3.27% of the respondents used dental floss to clean the approximal teeth surface. The brushing teeth frequency was shown to have a significant impact on the values of GI and MPBI. The study by Jain et al. showed similar findings, in which, it was confirmed that Jain monks have poor oral hygiene and an increased prevalence of periodontal disease compared to those of a similarly

**Table 3: The results of the measurement of oral hygiene index-simplified, gingival index and Modified Papillary Bleeding Index**

| Group          | OHI-S | GI   | MPBI |
|----------------|-------|------|------|
| 1A (monks)     | 2.1 (2.1; 2.4) | 1.7 (0; 2.1) | 2 (0; 3) |
| 1B (priests)   | 2.7 (2.1; 3)   | 2.1 (0; 2.2) | 2 (0; 2.2) |
| 2 (control, local residents) | 2.1 (1.5; 2.5) | 1 (0; 2.1) | 1.1 (0; 2.1) |

Me (Q1; Q3), where Me=Median, Q1 and Q3=First and third quartile. OHI-S=Oral hygiene index-simplified, GI=Gingival index, MPBI=Modified Papillary Bleeding Index

**Table 4: The results of the measurement of Decayed, Missing, and Filled Teeth index, oral hygiene index-simplified, gingival index, and Modified Papillary Bleeding Index**

| Group          | DMFT (overall) | D  | M  | F  |
|----------------|----------------|----|----|----|
| 1A (monks)     | 10 (6; 15)     | 4  (2; 6) | 3 (2; 5) | 3 (2; 4) |
| 1B (priests)   | 10 (8; 14)     | 3  (2; 4) | 3 (2; 5) | 4 (3; 5) |
| 2 (control, local residents) | 9 (6; 14)     | 3 (1; 5) | 2 (2; 4) | 4 (3; 6) |

Me (Q1; Q3), where Me=Median, Q1 and Q3=First and third quartile. OHI-S=Oral hygiene index-simplified, GI=Gingival index, MPBI=Modified Papillary Bleeding Index

**Table 5: Statistically significant results of ANOVA**

| Dependent       | Source                | SS  | Df  | MS  | F    | Significant |
|-----------------|-----------------------|-----|-----|-----|------|-------------|
| GI              | Sweet food intake     | 16.9 | 3   | 8.76 | 1.09 | 0.014       |
| GI              | Frequency of toothbrushing | 14.35 | 3   | 4.78 | 2.41 | 0.067       |
| Mühlmann index  | Frequency of food intake | 5.75  | 2   | 3.65 | 0.95 | 0.001       |
| Mühlmann index  | Frequency of toothbrushing | 19.27 | 3   | 6.42 | 2.92 | 0.034       |

SS=Sum of square, MS=Mean square
aged general population. This is due to their religion as many Jain individuals avoid brushing their teeth, especially during fasting.\textsuperscript{[8]} It has been shown that toothbrushing frequency is associated with a higher risk of caries\textsuperscript{[10‑13]} and periodontal diseases.\textsuperscript{[14‑17]} However, frequencies of mechanical removal of plaque up to 24 h were reported to be enough to prevent an increase in the severity of gingival inflammation (in patients with no history of periodontitis).\textsuperscript{[18]} At the same time, the quality of plaque removal is an important factor for the development of gingival inflammation, even if the frequency of toothbrushing is acceptable. For example, Weijden et al. (2005) found that in adults with gingivitis the quality of self-performed mechanical plaque removal was not sufficiently effective and should be improved.\textsuperscript{[19]} The questionnaire in the present study also revealed a poor level of awareness about the use of devices for interdental cleaning. It can be hypothesized that those monks and priests who were unaware of the importance of cleaning teeth at least twice a day were also unaware of the proper technique. Therefore, the effectiveness of plaque removal was poor, which also contributed to higher values of GI and MPBI.

With respect to caries, the toothbrushing frequency is also not the only important factor. For example, the incidence of dental caries in young Japanese adults (men) was influenced by DMFT values at baseline rather than toothbrushing frequency.\textsuperscript{[20]} That means that patients with more previous dental caries will have a higher risk of future dental caries, irrespective of the toothbrushing frequency. The use of fluorides can also influence the caries incidence. In a recent review of 70 clinical trials, 24\% of caries lesions were prevented by using fluoride compared with nonfluoride toothpastes, and this did not decrease by exposure to fluoridated water.\textsuperscript{[21]} In the present study, the respondents reported that the main factor when choosing toothpaste was the price, and they were not aware of the concentration of fluoride in the toothpaste they used. The concentration of fluoride in drinking water in the region has also been reported to be low (0.14–0.17);\textsuperscript{[22]} however, this factor is of minor importance as many of the monks and priests were not born in that particular area.

According to the survey conducted in the present study, monks consume 195–260 g of sugar with drinks every day. The consumption of the increased amounts of sugar along with the poor availability of dental help might have caused a higher prevalence of caries and led to a higher number of missing teeth and a lower number of filled teeth among clergymen. These data correspond with the results reported by Musaiger et al.: women who consumed sweet food and drinks 4 or more days/week had an increased risk of dental caries.\textsuperscript{[19]}

It is well known that nutrition has an impact on the systemic health as well as on the oral health. According to the results of the present study, the frequency of food intake in the groups of priests and monks was lower compared to the control group. In addition, clergymen usually fast 200–280 days in 1 year, with certain types of food (mainly animal proteins) being prohibited. The alteration of the nutrition regimen and composition of food during fasting may cause protein–energy malnutrition which occurs when the amount of protein, energy foods, or both, is not sufficient for the body’s needs. Malnutrition may alter the homeostasis, which can lead to the oral cavity disease progression, reduce the resistance to the microbial biofilm, and reduce the capacity of tissue healing. Studies have suggested that enamel hypoplasia, salivary gland hypofunction, and saliva compositional changes may be the mechanisms through which the malnutrition is linked with caries and other oral diseases.\textsuperscript{[23]} The aforementioned factors may explain our finding that the frequency of food intake influenced significantly on the values of GI and MPBI.

An association between religiousness or spirituality and health has been recognized.\textsuperscript{[24]} Religious individuals are often committed to healthy lifestyles, and many religions around the world possess negative views about tobacco, alcohol consumption, and drugs.\textsuperscript{[25]} A number of studies also assessed the influence of religiousness or spirituality on oral health. In the study by Zini et al., the relationship between religion and periodontitis among the Jewish population of Jerusalem was assessed.\textsuperscript{[8]} Higher levels of religiousness were related to lower levels of periodontitis. The authors conclude that religiousness had a protective effect against periodontitis through extrinsic and intrinsic pathways.\textsuperscript{[8]} Zini et al. (2012) also assessed the relationship between religiousness and dental caries in the same population and found that secular people had significantly higher DMFT than religious and Orthodox (Jewish) people.\textsuperscript{[26]} The direction of the revealed association suggested that being religious had a protective effect on caries experience. The results of the present study revealed that there were no significant differences in the number of decayed teeth among the groups of clergymen and local residents, and the values of MPBI in monks were higher than in the other groups.\textsuperscript{[26]} It should be noted that the present study was not aimed at comparing the influence of being religious or secular on dental health as many of the local residents are also religious and attend monasteries and churches on a regular basis.
We found a substantial lack of dental help for clergymen. Most clergymen avoided visiting the dentist for prophylactic checkups and preferred to postpone the visit until they had a serious problem. This is especially true of monks who live in a monastery and have lots of duties and lack of personal time. As a result, they have more decayed and extracted teeth and less filled teeth compared with other groups. Priests follow the same fasting regimens as monks, but they live in their own homes in towns and villages near the churches and chapels where they serve, and as a result, they have better availability of dental help, and their nutrition is more beneficial for general and dental health preservation. This is confirmed by the results of survey in the priest’s group, which showed a strong correlation with monks and a moderate correlation with local residents.

The potential way to solve the problem of availability of dental help in monasteries is to educate some clergymen about oral hygiene and basic symptoms of dental diseases. These trained clergymen could provide initial consultation and “refer” their “patients” to the dentist. Similarly, Muangman and Hirunraks proposed to provide short training for some of the Buddhist monks so that they were prepared to provide primary health-care services to their own community.[27] Dental schools of medical institutions could also establish dental offices in monasteries, with volunteers providing dental education and treatment. Specific attention should be paid to the dental education and prevention of dental diseases.

The study had several limitations that need to be taken into account while interpreting the findings. The participants of the study were recruited from the single monastery, representing only small group of the whole population. The control group included people from the nearby villages who agreed to be examined by the volunteers. Therefore, generalizability of the study results is limited. The future research should take into consideration about the generalizability of the findings among orthodox priests and monks. Besides, the monastery is located in a small town with poor availability of dental clinics, both private and public.

CONCLUSIONS
The results of the present study showed that most priests and monks had a smaller number of filled teeth and a greater number of missing teeth as well as teeth affected with erosions and wedge-shaped defects compared with local residents of a similar age. The significant impact of toothbrushing and food intake frequency on gingival inflammation was also shown. These differences could be attributed to the specific diet, lifestyle, limited access to dental care, and insufficient awareness of the importance of individual dental hygiene in clergymen.

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CONFLICTS OF INTEREST
There are no conflicts of interest.

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