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Clinical and situational analysis structured elements of caries intensities in motivation of the algorithm's rehabilitation of caries pathology beside flying personnel of civil aviation

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Abstract

AIM. Study the structured factors of caries intensities in depending of cariesology status' level besides flying personnel of the civil aviation for the reason's motivations of the algorithm to rehabilitations of caries pathology.

MATERIALS AND METHODS. In the article presented results of structured caries intensities in depending the level of cariesology status besides flying personnel at the age 20–60 years and senior. In the course of called on studies were examined 568 employees of the flying composition of civil aviation. Structured estimation of caries intensities was organized according to designed and approved methods of the professor A.V. Alimskiy.

RESULTS. Total importance of the complicated forms of caries amongst aircraft workman with compensates and subcompensates forms of cariesology status has formed accordingly 0.88 ± 0.11 and 3.00 ± 0.19, while amongst examined with decompensate form of cariesology status total importance under investigation realistically increased to 5.77 ± 0.49 units in calculation on one examined.

CONCLUSIONS. The highest index of caries intensities revealed besides flying personnel with decompensates form of cariesology status.

Keywords: cariesology status, flying personal, civil aviation, caries intensities

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Клинико-ситуационный анализ структурных элементов интенсивности кариеса зубов в обосновании алгоритма реабилитации кариесологической патологии у летного персонала гражданской авиации

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Резюме

ЦЕЛЬ. Изучение структурных показателей интенсивности кариеса зубов в зависимости от уровня кариесологического статуса у лётного персонала гражданской авиации с целью обоснования алгоритма реабилитации кариесологической патологии.

МАТЕРИАЛЫ И МЕТОДЫ. В работе представлены результаты структуризации интенсивности кариеса зубов в зависимости от уровня кариесологического статуса у лётного персонала в возрасте 20–60 лет и старше. В ходе проведенного исследования было обследовано 568 сотрудников лётного состава гражданской авиации. Структурная оценка интенсивности кариеса зубов была проведена согласно разработанной и апробированной методике профессора А.В. Алимского.

РЕЗУЛЬТАТЫ. Суммарное значение осложненных форм кариеса зубов среди авиаработников с компенсированной и субкомпенсированной формами кариесологического статуса составили соответственно 0,88 ± 0,11 и 3,00 ± 0,19, в то время как среди обследованных с декомпенсированной формой кариесологического статуса суммарное значение исследуемых показателей достоверно увеличилось до 5,77 ± 0,49 единиц в расчете на одного обследованного.

ВЫВОДЫ. Наиболее высокий индекс интенсивности кариеса зубов нами выявлен у лётного персонала с декомпенсированной формой кариесологического статуса, несколько меньше он был у лиц, имеющих суб- и компенсированные формы кариесологического статуса.

Ключевые слова: кариесологический статус, лётный персонал, гражданская авиация, интенсивность кариеса

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INTRODUCTION

Pathological processes in the oral tissues and organs are a pressing issue in medicine and dentistry due to their high prevalence among the population. As chronic sources of infection, these conditions often contribute to the development of focal diseases. Untimely oral sanitation leads to more severe and advanced forms of diseases affecting the hard tissues of the teeth and periodontium, complicating treatment, prolonging recovery, and worsening outcomes [1–3]. Improving and enhancing the quality of dental care relies on knowledge of the clinical-epidemiological and socio-economic characteristics of a specific region, which is related to the multifactorial origin of dental diseases [4–6].

AIM

To examine the structural indicators of dental caries intensity based on the level of carious status among civil aviation flight personnel to substantiate an algorithm for rehabilitating carious pathology.

MATERIALS AND METHODS

In the course of the study, 568 civil aviation flight personnel were examined to assess the intensity of dental caries according to the level of carious status. The structural assessment of dental caries intensity was performed following the methodology developed and validated by Professor A.V. Alimsky. During the structural analysis, the following structural indicators of caries intensity were studied and analyzed:

– element K – superficial and medium caries;

– element P – caries complications requiring treatment;

– element H – caries complications requiring extraction;

– element F – filled teeth;

– element M – missing teeth.

Statistical analysis of the obtained data was performed according to general medical statistical principles applied to dentistry using the Statistica software. The reliability of differences in mean values was assessed using Student's t-test. Differences were considered statistically significant at $p < 0.05$.

RESULTS

The study revealed that among the examined flight personnel, 14.5% had a compensated carious status level (CPI = 1–3), 40.9% had a subcompensated level (CPI = 4–7), and 36.5% had a decompensated level (CPI > 8). In 8.1% of cases, an intact carious status (CPI = 0) was observed.

The data on dental morbidity among flight personnel confirm its high intensity in individuals with a decompensated carious status compared to those with compensated and subcompensated forms. Comparative data in Table 1 indicate that the caries intensity tends to increase with age.

According to Table 1, the caries intensity values in the 20–29 age group among flight personnel with compensated, subcompensated, and decompensated carious statuses were 1.51 ± 0.22, 4.63 ± 0.37, and 8.12 ± 0.69 affected teeth per patient, respectively. In the 30–39 and 40–49 age groups, these indicators were 1.68 ± 0.26, 5.87 ± 0.41, 8.97 ± 0.76, and 1.86 ± 0.28, 5.98 ± 0.44, 11.11 ± 1.12, respectively. In the 50–59 age group and 60 years and older, the average values were 2.46 ± 0.32, 6.73 ± 0.46, 12.60 ± 1.91, and 2.92 ± 0.34, 6.95 ± 0.61, 13.18 ± 2.01, respectively.

The results indicate that the average CPI values among individuals with compensated, subcompensated, and decompensated carious statuses were 2.09 ± 0.28, 6.03 ± 0.46, and 10.80 ± 1.3, respectively. Thus, the highest average caries intensity index was observed in individuals with a decompensated carious status, followed by those with subcompensated and compensated statuses.

The calculations revealed that the positive difference in the dynamics of caries intensity among flight personnel, depending on the form of carious status, ranged from 3.94 ± 0.18 to 4.77 ± 0.84 affected teeth per individual. A similar difference, depending on the age factor, among individuals with a compensated form of carious status ranged from 0.17 ± 0.04 to 0.60 ± 0.04 affected teeth. Among individuals with a subcompensated form of caries intensity, the variability based on age ranged from 0.11 ± 0.03 to 1.24 ± 0.04, while among flight personnel with a decompensated form of carious status, it ranged from 0.58 ± 0.10 to 2.14 ± 0.36 affected teeth.

For planning and developing a differentiated approach to improving caries management, the most valuable information comes from data characterizing the structure of caries intensity among civil aviation flight personnel. The results of the structural analysis of caries intensity in flight personnel indicate that despite a moderate level of caries prevalence, the structure of the CPI index among individuals with compensated, subcompensated, and decompensated forms of carious status was highly unfavorable. This is primarily due to the high proportion of missing teeth.

This issue is particularly evident across all age groups of flight personnel with compensated carious status. For example, in the 20–29 age group, the proportion of missing teeth averaged 0.86 ± 0.09, accounting for 56.95% of the total CPI index (1.51 ± 0.22) per individual (Table 2).

In the 30–39 age group of flight personnel with compensated carious status, missing teeth accounted for 56.55% of the CPI index structure, with an average value of 1.68 ± 0.26 per individual. In the 40–49, 50–59, and 60+ age groups, the corresponding figures were 54.30%, 52.85%, and 50.68%, respectively, of the total quantitative values of the caries intensity index (1.86 ± 0.28, 2.46 ± 0.32, and 2.92 ± 0.34, respectively).

When analyzing the components comprising the CPI index, it was found that the age-specific structure among flight personnel with a compensated carious status in the 20–29 age group was 5.30%, 11.26%, 23.84%, 56.95%, and 2.65% for the elements K, P, H, F и M.

For civil aviation flight personnel in the 30–39 age group, the values of the structural elements of caries intensity with a compensated carious status were 2.38%, 13.10%, 24.40%, 3.57%, and 56.55% for uncomplicated forms of caries (element K), caries complications requiring treatment (element P) and extraction (element H), and missing teeth (element M) (Fig. 1).

As shown in the figure, the structural elements of caries intensity among flight personnel with a compensated form of carious status aged 40–49 years, except for the proportion of missing teeth (54.30%), were also comparatively higher for the other elements (K, P, H, F), amounting to 2.69%, 15.59%, 24.73%, and 2.69%, respectively.

Among flight personnel aged 50–59 years, the values of the aforementioned elements of caries intensity were 1.22%, 19.10%, 25.20%, 1.63%, and 52.85%, respectively. For individuals aged 60 years and older, the percentage values were 0.69%, 20.89%, 26.71%, 1.03%, and 50.68%, respectively.

Overall, the average values of the structural elements of caries intensity for flight personnel with a compensated form of carious status were 2.39%, 16.75%, 25.36%, 1.91%, and 53.59% (Fig. 2).

Table 1. Age factors of caries intensity in depending of forms cariesology status beside flying personnel (at the average on one examined)

Таблица 1. Повозрастные показатели интенсивности поражения кариесом зубов в зависимости от формы кариесологического статуса у лётного персонала (в среднем на одного обследованного)

FCS	Caries Intensity (CPI Index)					On average
	20–29 years	30–39 years	40–49 years	50–59 years	60 years and >	
C-FCS	1.51 ± 0.22	1.68 ± 0.26	1.86 ± 0.28	2.46 ± 0.32	2.92 ± 0.34	2.09 ± 0.28
S-FCS	4.63 ± 0.37 $P_1 < 0.01$	5.87 ± 0.41 $P_1 < 0.001$	5.98 ± 0.44 $P_1 < 0.001$	6.73 ± 0.46 $P_1 < 0.001$	6.95 ± 0.61 $P_1 < 0.001$	6.03 ± 0.46 $P_1 < 0.001$
D-FCS	8.12 ± 0.69 $P_2 < 0.001$	8.97 ± 0.76 $P_2 < 0.001$	11.11 ± 1.12 $P_2 < 0.001$	12.60 ± 1.91 $P_2 < 0.001$	13.18 ± 2.01 $P_2 < 0.001$	10.80 ± 1.3 $P_2 < 0.001$

Note: FCS – Form of Carious Status; C-FCS – Compensated Form; S-FCS – Subcompensated Form; D-FCS – Decompensated Form; P_1 – Significance in relation to values of individuals with a compensated form of carious status; P_2 – Significance in relation to values of individuals with a subcompensated form of carious status.

Примечание: ФКС – форма кариесологического статуса; КФКС – компенсированная форма; СФКС – субкомпенсированная форма; ДФКС – декомпенсированная форма; P_1 – достоверность по отношению к значениям у лиц с компенсированной формой кариесологического статуса; P_2 – достоверность по отношению к значениям у лиц с субкомпенсированной формой кариесологического статуса.

Table 2. Structuredof caries intensity beside flying personnel with compensate form of cariesology status in depending of age (at the average on one examined)

Таблица 2. Структуризация интенсивности кариеса зубов у лётного персонала с компенсированной формой кариесологического статуса в зависимости от возраста (в среднем на одного обследованного)

Age, year	Structural Elements of CPI Index					Total CPI Index
	K	P	H	F	M	
20–29	0.08 ± 0.02	0.17 ± 0.04	0.36 ± 0.05	0.04 ± 0.02	0.86 ± 0.09	1.51 ± 0.22
30–39	0.04 ± 0.02	0.22 ± 0.05	0.41 ± 0.06	0.06 ± 0.02	0.95 ± 0.11	1.68 ± 0.26
40–49	0.05 ± 0.03	0.29 ± 0.06	0.46 ± 0.06	0.05 ± 0.02	1.01 ± 0.11	1.86 ± 0.28
50–59	0.03 ± 0.01	0.47 ± 0.06	0.62 ± 0.06	0.04 ± 0.02	1.30 ± 0.17	2.46 ± 0.32
60 и >	0.02 ± 0.01	0.61 ± 0.07	0.78 ± 0.07	0.03 ± 0.01	1.48 ± 0.18	2.92 ± 0.34
В среднем	0.05 ± 0.02	0.35 ± 0.06	0.53 ± 0.05	0.04 ± 0.02	1.12 ± 0.13	2.09 ± 0.28

Note: here and in Tables 3 and 4: K – superficial and moderate caries of teeth; P – caries complications requiring treatment; H – caries complications requiring extraction; F – filled teeth; M – missing teeth.

Примечание: здесь и далее в табл. 3 и 4: K – поверхностный и средний кариес зубов; P – осложнения кариеса зубов, подлежащие лечению; H – осложнения кариеса зубов, подлежащие удалению; F – пломбированные зубы; M – удаленные зубы.

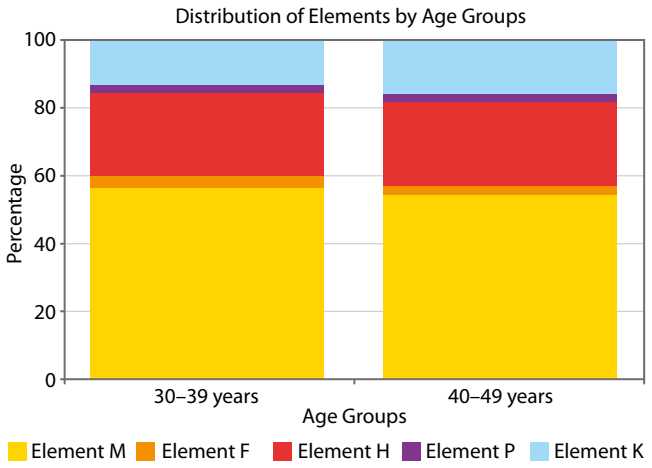

Fig. 1. Structured of compensate forms cariesology status beside flying composition

Рис. 1. Структуризация компенсированной формы кариесологического статуса у лётного состава

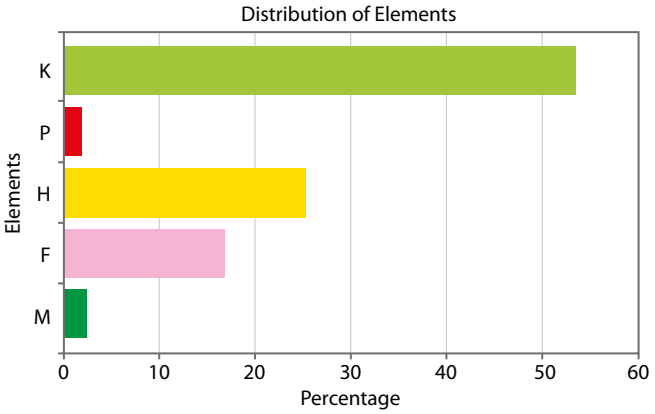

Fig. 2. Averaged importance's forming elements of caries intensity under compensate form of carisology status beside flying composition of the civil aviation

Рис. 2. Усредненные значения составляющих элементов интенсивности кариеса зубов при компенсированной форме кариесологического статуса у лётного состава гражданской авиации

The data presented in Table 3 convincingly demonstrate a comparatively higher volume of anticipated therapeutic and surgical dental care required among flight personnel with a subcompensated form of carious status compared to those with a compensated form of caries intensity. Among the examined individuals, the proportion of caries complications requiring treatment (element P) remains relatively stable across all age groups (1.03±0.06, 1.21±0.07, 1.31±0.08, 1.42±0.09, and 1.53±0.10) and should be appropriately considered when planning therapeutic dental care for these individuals.

Additionally, among flight personnel with a subcompensated form of carious status, an important indicator – caries complications requiring extraction (element X) – with corresponding values of 1.43±0.13 (30.67%), 1.99±0.14 (33.90%), 2.05±0.18 (34.28%), 2.69±0.20 (39.97%), and 3.17± 0.36 (45.61%), reflects a significant need for tooth extractions among the examined individuals. It should be noted that these extractions include teeth requiring removal not only due to caries complications but also as a result of periodontal diseases.

The findings presented in Table 3 strongly highlight the considerable volume of required therapeutic and surgical dental care among flight personnel with a subcompensated form of carious status, surpassing the needs of those with a compensated form of caries intensity. The stable proportion of caries complications requiring treatment (element P) across all age groups underlines the need to prioritize this element in planning dental care. Furthermore, the elevated proportion of caries complications requiring extraction (element H) in individuals with a subcompensated form of carious status underscores a substantial need for tooth extractions, reflecting both caries complications and periodontal disease-related cases.

The proportion of missing teeth (element M) among flight personnel increases from 1.43 ± 0.13 units per individual with a subcompensated form of carious status in the 20–29 age group to 3.17 ± 0.36 in the 60+ age group, i.e., more than doubling. A comparative analysis of element "X" indicates that its value increases by 1.4 times in individuals aged 60 years and older. This fact should guide dentists toward expanding the scope of surgical dental care for the examined cohort of aviation workers.

Table 3. Structured of caries intensity beside flying personnel, having subcompensate form of cariesology status in depending of age (at the average on one examined)

Таблица 3. Структуризация интенсивности кариеса зубов у лётного персонала, имеющих субкомпенсированной формы кариесологического статуса в зависимости от возраста (в среднем на одного обследованного)

Age, in years	Structural Elements of the CPI Index					Total CPI Index
	K	P	H	F	M	
20–29	0.77±0.06	1.03±0.06	1.33±0.09	0.07±0.03	1.43±0.13	4.63±0.37
30–39	0.92±0.07	1.21±0.07	1.70±0.10	0.05±0.03	1.99±0.14	5.87±0.41
40–49	0.84±0.05	1.31±0.08	1.75±0.11	0.03±0.02	2.05±0.18	5.98±0.44
50–59	0.77±0.04	1.42±0.09	1.83±0.12	0.02±0.01	2.69±0.20	6.73±0.46
60 и >	0.33±0.02	1.53±0.10	1.90±0.12	0.02±0.01	3.17±0.36	6.95±0.61
On average	0.73±0.05	1.30±0.08	1.70±0.11	0.04±0.02	2.27±0.20	6.03±0.46

Table 4. Structured of caries intensity beside flying personnel, having debcompensate form of cariesology status in depending of age (at the average on one examined)

Таблица 4. Структуризация интенсивности кариеса зубов у лётного персонала с декомпенсированной формой кариесологического статуса в зависимости от возраста (в среднем на одного обследованного)

Age, in years	Structural Elements of the CPI Index					Structural Elements of the CPI Index
	K	P	H	F	M	
20–29	0.54±0.06	2.25±0.15	2.37±0.17	0.10±0.04	2.86±0.27	8.12±0.69
30–39	0.61±0.07	2.34±0.16	2.42±0.19	0.09±0.04	3.51±0.30	8.97±0.76
40–49	0.67±0.07	2.90±0.20	3.11±0.26	0.10±0.06	4.33±0.53	11.11±1.12
50–59	0.32±0.03	3.03±0.28	3.57±0.36	0.06±0.03	5.62±1.21	12.60±1.91
60 и >	0.10±0.02	3.17±0.30	3.69±0.41	0.03±0.01	6.19±1.27	13.18±2.01
On average	0.45±0.05	2.74±0.21	3.03±0.28	0.08±0.04	4.50±0.72	10.80±1.30

As we have determined, the average intensity of elements C and F within the CPI index structure among flight personnel with a decompensated form of carious status was at its minimum (respectively 0.45±0.05 and 0.08±0.04), while the average values for elements P, H, and M were 2.74±0.21, 3.03±0.28, and 4.50±0.72, respectively (Table 4).

DISCUSSION

The collected data reveal a pronounced age-related dynamic in the proportion of missing teeth within the CPI index structure for flight personnel with a subcompensated form of carious status. The proportion of this element sharply increases with age, ranging from an absolute value of 1.43±0.13 and 1.99±0.14 missing teeth per individual in the 20–29 and 30–39 age groups, respectively, to 2.05±0.18 and 2.69±0.20 in the 40–49 and 50–59 age groups, and finally reaching 3.17±0.36 in the 60+ age group. In other words, nearly half of the CPI index structure in the examined age groups of flight personnel with a subcompensated form of carious status is represented by missing teeth (37.6%) alongside average values for the elements K (12.1%), P (21.5%), H (28.2%), and F (0.6%).

A comparison of the obtained data for flight personnel in the aviation sector with a decompensated form of carious status against those with compensated and subcompensated forms showed a significant increase in the proportion of missing teeth (element M) within the CPI index. The average number of missing teeth for compensated, subcompensated, and decompensated carious statuses was 1.12±0.13, 2.27±0.20, and 4.50±0.72, respectively. The increase in the number of missing teeth for subcompensated carious status was 1.15±0.07 teeth per individual compared to the compensated form, while for decompensated carious status, the positive increase in missing teeth (element M) was 3.38±0.59.

When comparing the structural elements of caries intensity in flight personnel, the influence of the carious status form on these elements was evident. The combined value of complicated caries forms (element P + element H) among personnel with compensated and subcompensated carious statuses was 0.88±0.11 and 3.00±0.19, respectively, while among those with decompensated carious status, the combined value significantly increased to 5.77±0.49 teeth per individual.

CONCLUSION

1. The comparative assessment of the CPI index elements revealed that missing teeth represent a significant proportion among the flight personnel examined. On average, for all aviation workers with a compensated form of carious status, the absolute value of missing teeth was 1.12±0.13. The highest proportion of missing teeth (4.50±0.72) was observed in individuals with a decompensated form of carious status, while an intermediate proportion (2.27±0.20) was found among those with a subcompensated form.

2. The data indicate a significant increase in caries prevalence and the need for all types of outpatient dental care among flight personnel. The collected clinical-epidemiological data on caries prevalence, intensity, and structure among flight personnel are of particular importance for the organization and planning of dental services within the medical units of aviation services.

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