

# Dental equipment - a factor for competitiveness of dental practice

## **Abstract:**

**Introduction:** Maintaining a competitive level in the market of dental services in modern working conditions requires a new approach and updated equipment in the dental practices. **Objective:** To analyze the importance of updating the equipment for profitability of the dental practice in the conditions of market mechanisms. **MM:** Anonymous survey is conducted among the Doctors of Dental Medicine (DDM) on the territory of the 28 regional Offices of the Bulgarian Dental Association (BgDA) / 2011-2013. Data is processed with SPSS 16.0. **Results:** Most of the offices show tendency to be supplied with more modern equipment. The modernization of the equipment is going at an uneven pace for the individual groups. 72.62% of the doctors under 30 and 68.48% from 31-40 years old work with units purchased after 2000. 55.1% of the dental units are Bulgarian-made in opposition to 24.8% which are imported. The data show: 11.21% of participants are working in newly purchased dental offices, 22.66% - with new dental units, 4.79% (59 DDM) - with new X-ray machines, and 54.51% (671) have purchased other new equipment. **Conclusion:** Gradual planned renewal of modern dental practices. Enrichment of additional technical resources. Modernization of the equipment in the private dental offices. Increasing revenues makes easily self-finance of the dental practice.

**Key words:** dental equipment, dental practice, dental office, new dental purchases

## **Introduction**

Modern working conditions and maintaining a competitive level in the market of dental services requires a new approach and updated equipment in the practice. The changed socio-economic conditions require maximum attention to every detail of the accoutreatments, the design, the appearance of the practice. It is very difficult to make a review of the dental equipment, because of the lack of scientific publication in professional journals (1). A new equipment, in competitive market is one of the most important factors for improving and expanding the dental services of a practice. Of course, the specific needs and functions of a practice will determine the type of the equipment (2).

Financial projects for new equipment, new opportunities and associated risks are important (3).

A new challenge is the dilemma of buying or renting an office - how profitable it is to own your own commercial space. It is important decision for the dentist, because on this base he/she will buy the equipment. The decision to buy a dental practice is the most important one in a young dentists professional career. It should be made only after a careful examination and review of the seller's practice (4). Significant knowledge of ergonomics and its practical application is vital for the prevention of musculoskeletal disorders. The role of ergonomics in equipment to prevent those work-related diseases is worthy of attention (5).

Once a decision is made, the time and effort required to identify an appropriate practice.

## **Aim and Purpose**

To analyze the importance of updating the equipment for the competitiveness of dental practice in the market conditions.

To establish the age of the machinery and its renewal

To establish work with foreign dental units and dental units produced in Bulgaria.

To identify the usage of additional equipment in the dental practices.

## Material and Methods

The survey was conducted in the form of a direct anonymous survey as of 2011-2013. A representative sample of the dentists registered with the 28 regional regional offices of the Bulgarian Dental Association was included.

The actual study was preceded by a pilot study. Data were collected as follows: for the pilot study September-December 2011; for the real one - in the period January 2012 - September 2013. The data were processed with specialized statistical software SPSS Statistics 20.0 (IBM Corp., Armonk, New York, USA)16.0 for Windows.

The result data was grouped in: "distribution by territory", "gender", "age groups", "work experience", "ownership of practices", "contracts concluded with NHIF", "specialty", "mode of practice", "with support staff". These are independent variables.

Dependent variables: "equipment", "apparatus", "mode of practice", "form of labor legal relations with other DDMs", "additionally support staff training".

Completing the the survey card was done directly by the respondents.

Indicators for studying the dynamics of the socio-professional status were done by dental demographics, qualification, mode of practice.

The development of the dental practice - through the ownership of the equipment, development of the team, number of specialists and improvement of the dental care offered.

Market development – through various forms of financing.

Sample and questionnaire.

The general population at the time of the study is 8242 DDM. The sample determined on the basis of the general population includes minimum 1350 people. For the reliability of the results, the sufficient number participants is 70% of 1350 (945 people). The sample size to comply with reliability is calculated according to the formula:

$$n = \frac{\frac{P[1-P]}{A^2} + \frac{P[1-P]}{N}}{R} = \frac{\frac{50[1-50]}{3^2} + \frac{50[1-50]}{8242}}{70} = 1350$$

Where: n – volume of the sample;

P – Variability of results (50%);

A – Random error (3%);

Z – Confidence Multiplier (1.96 at 95% confidence level);

R – Response rate (70%).

## Results

One thousand and nine hundred questionnaires were distributed, proportionally in all districts of the country. The participants were members of BgDA. They fill in the questionnaire at

the postgraduate seminars, organized by Regional Offices of Bulgarian Dental Association. One thousand and three hundred thirty one of the questionnaires were correctly completed and returned. This is 16.15% of the total number of DDM (2011), with 95% confidence interval ( 15.40% ÷ 17.00%), with a response rate of 70.10%.

The available dental units were divided into two groups. The continuous improvements of the dental technology are leading to development of the market. Parallel to that, modernization of the dental equipment is observed. At the moment, the use of Bulgarian units is still prevailing. In order to specify, without defining the brands, the used equipment is conditionally included in two groups. Each group is divided into two subgroups. The first group is including machines placed in service before 1990, and subgroups - before and after 1980. The second group includes machines purchased and installed in offices from 1991 to 2011. In this group the subgroups are: 1991-2000 and after 2001 (Table1).

**Table 1 Distribution of DDM depending on the year of production of the dental unit**

<b>The year of production of the dental units, used in dental office</b>			
<b>Before 1990 r.</b>		<b>After 1991 r.</b>	
<b>Before 1980 r. n (%)</b>	<b>1981-1990 r. n (%)</b>	<b>1991-2000 r. n (%)</b>	<b>After 2001 r. n (%)</b>
<b>64 (6, 17%)</b>	<b>150 (14, 46%)</b>	<b>295 (28, 45%)</b>	<b>528 (50, 92%)</b>
<b>TOTAL I-st group: 214 (20,63%)</b>		<b>TOTAL II group: 823 (79,37%)</b>	
<b>TOTAL: 1037 (100%)</b>			

Most of the offices show tendency to be supplied with more modern equipment (823 machines purchased after 1991, compared to 214 purchased before 1990). This is an indicator that would lead to more rational, efficient and modern dental care for patients.

The data show that the modernization of the equipment is going at an uneven pace for the individual groups. The largest number of units made between 1991 and 2000 are purchased from dentists with age 41 and plus years old, while those made after 2000 are purchased from the dentists with age until 40.

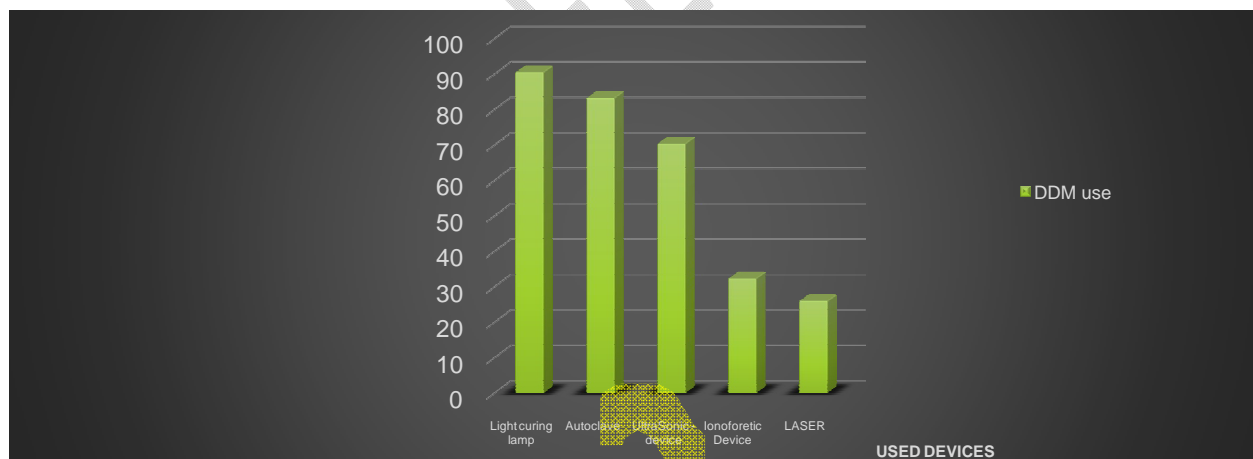
A statistically significant relationship is established between the renewal of the units and the age group of the dentists who have worked in those dental practices. Sixty-one (72.62%) of the doctors in the first age group and 126 in the second group (68.48%) work with units purchased after 2000. This is related to the desire to improve the quality of dental care among young colleagues and at the same time only 28.43% (29 doctors) of over 60 years old renew their machinery with units after 2000. The trend is reversed with the old machinery: with machines made before 1980 work 1.19% of DDM from the age group under 30 and 15.69% of those over 60 (Table2).

**Table 2 Distribution of DDM depending on the year of production of the dental unit and the age group**

Age group	≤ 30 n (%)	31 ÷ 40 n (%)	41 ÷ 50 n (%)	51 ÷ 60 n (%)	> 60 n (%)	Total n (%)
Which year is the dental unit, you're working with?						
< 1980	1 (1,19%)	8 (4,35%)	9 (2,95%)	30 (8,45%)	16 (15,69%)	64 (6,21%)
1981-1990	14 (16,67%)	13 (7,07%)	41 (13,44%)	65 (18,31%)	17 (16,67%)	150 (14,56%)
1991-2000	8 (9,52%)	37 (20,11%)	80 (26,23%)	127 (35,77%)	40 (39,22%)	292 (28,35%)
> 2001	61 (72,62%)	126 (68,48%)	175 (57,38%)	133 (37,46%)	29 (28,43%)	524 (50,87%)
<b>Total</b>	84 (100,00%)	184 (100,00%)	305 (100,00%)	355 (100,00%)	102 (100,00%)	1030 (100,00%)

The data presents that 747 (55,10%) of the participants are working with Bulgarian made units, 337 (24,80%) – with imported ones and 273 (20,10%) give a vague answer "Other". Important fact is that 669 of the machines, made in Bulgaria, are older models (Media, US-5, US-7) and 78 are more contemporary - "Micromotor", "Anvita". The biggest part of the imported machines are Hirana – 91, and second and third are respectively Siemens - 65 and KAVO - 42.

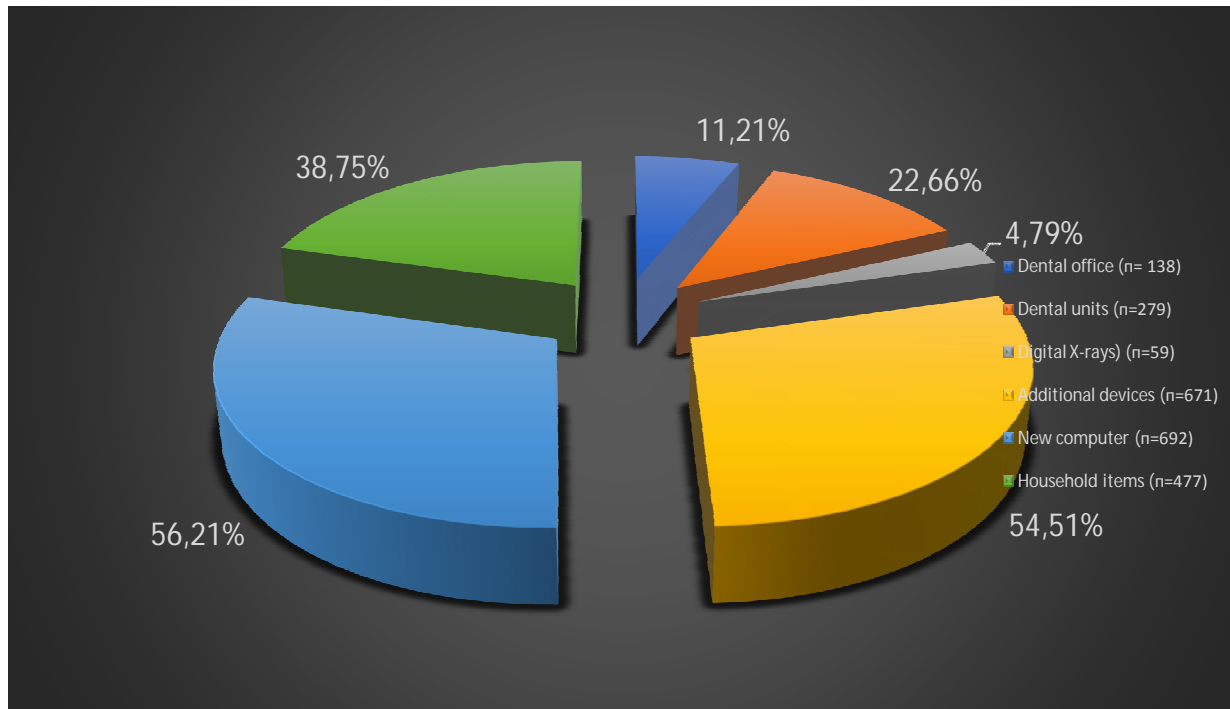
In the present study the data about the distribution of additional equipment in dental offices shows that one thousand three hundred and four of the participants answered with more than one answer. One thousand one hundred and eighty one DDM are using photopolymer lamp (90.57%), 1086 DDM are using autoclaves (83.28%), 918 DDM are using ultrasound machine (70.40%), 339 DDM are using laser devices (26%) (also includes doctors who use a laser located in a foreign office). Two hundred and forty-nine of the respondents (19.10%) indicate that the office in which they work also has an X-ray for segment graphics (Fig.1).



**FIG. 1** Distribution of additional equipment in dental offices

In the last three years, 692 computers were purchased, which represents 56.21% of the responding dentists.

All participants (excluding those, working only in the field of oralsurgery) are using the services of dental technician. The number of dental clinics with their own dental technician laboratories is insignificantly small (Fig.2).



**FIG. 2** Distribution of DDM by newly purchased equipment for the practice during the last three years

There is a clear tendency to buy computer equipment and accessories in all age groups. There is a steady trend for the purchase of household items (cleaning and disinfecting agents, towels and other aids). The big interest in buying of new dental units among the dentists of age of 60 years old and over is most likely in anticipation of a future dentist in the family. Desire to buy a new dental office, among dentists above 41 years decreases, reaching almost zero in at the age over 60 years (Fig.3).

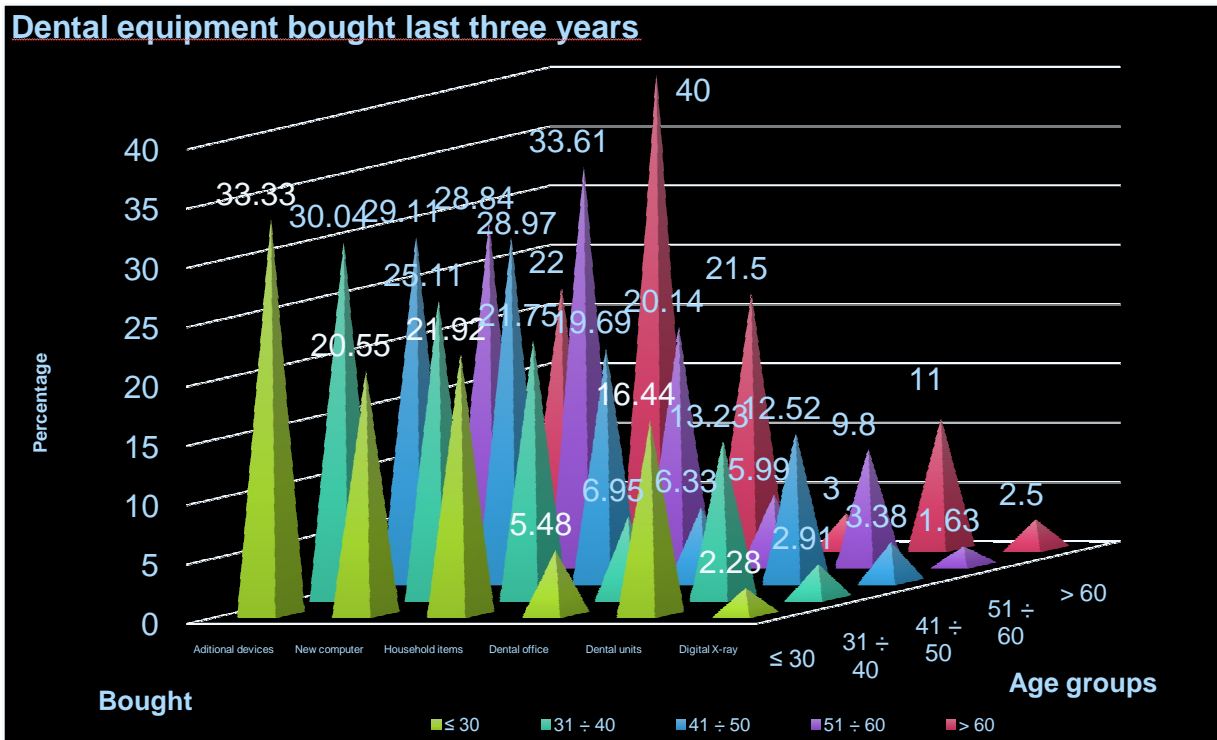


FIG. 3 Distribution of DDM by new equipment purchased in the last 3 years and age group

The owners usually buy purchase fixed assets such as dental office, dental unit, digital X-ray respectively 5,7%, 11,8%, 2,9% vs nonowners respectively: 2,6%, 7,8%, 0,00% . At the same time non-owners buy equipment for current use: additional devices (34,30%), household items (25,70%) vs 28,70% and 20,30% for owners. Almost equal parts of owners and non-owners buy computers, respectively: 30,60% : 29,50% (Fig.4).

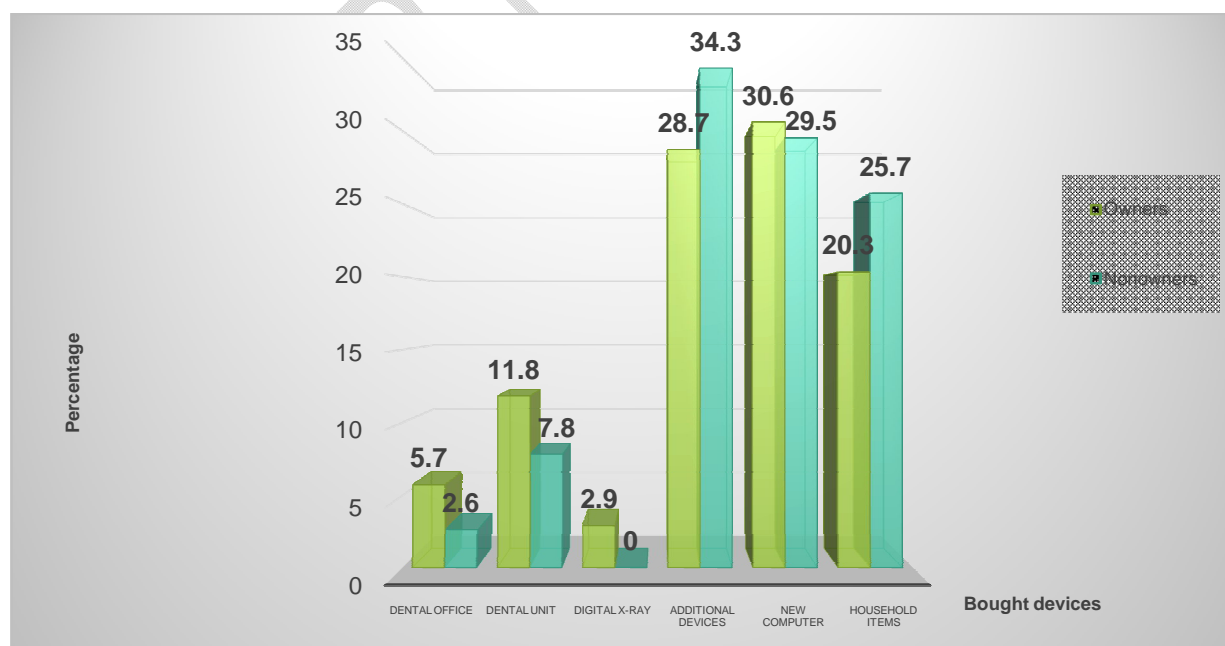
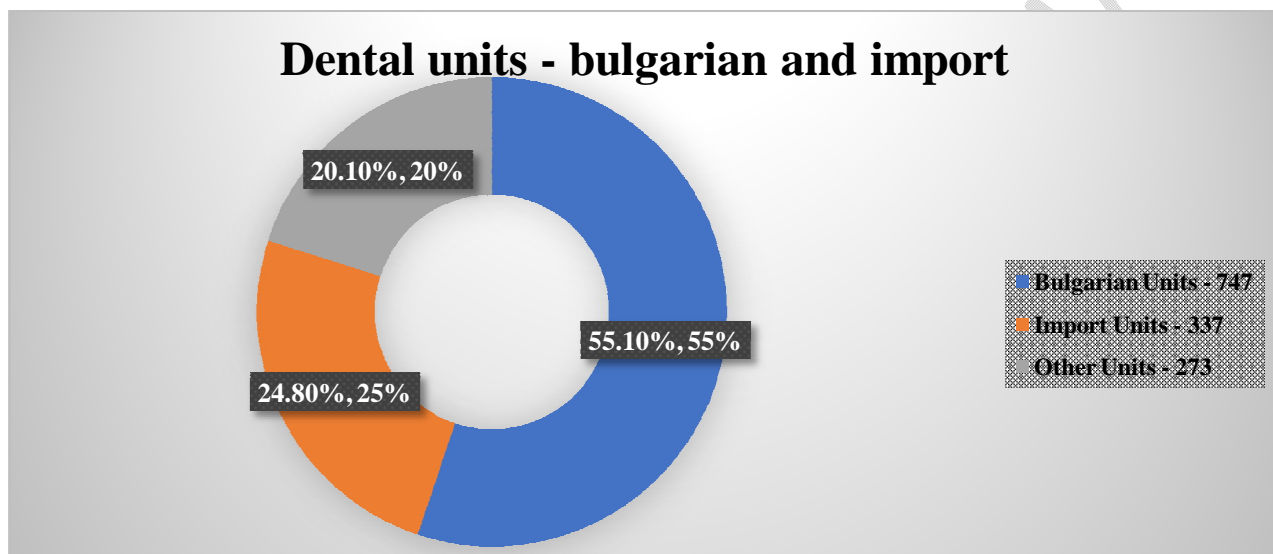
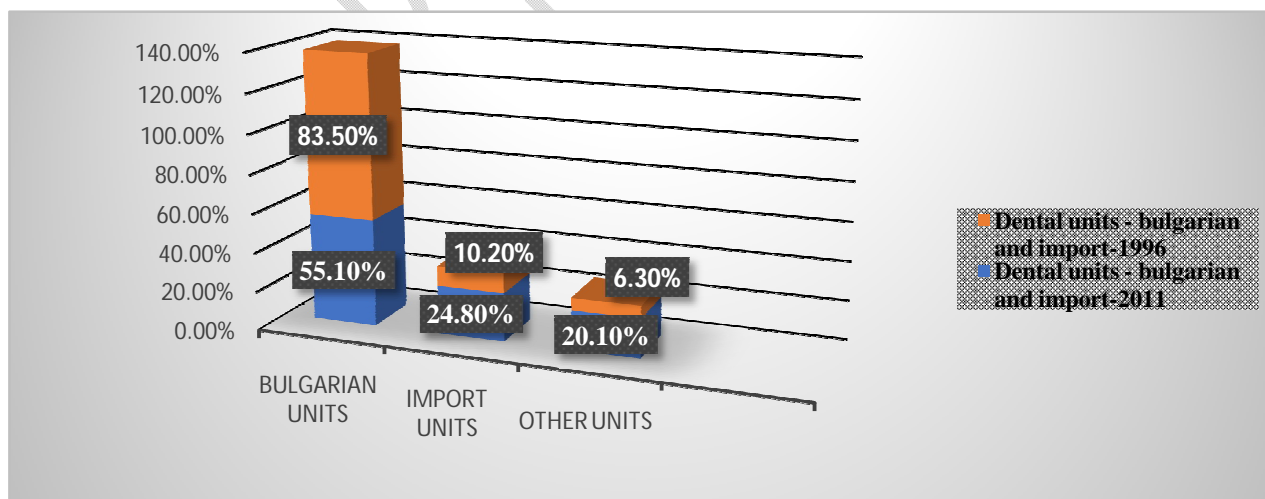


FIG. 4 Distribution of the renewed dental property according to ownership

The answers received are more than the number of participants because some of them work on more than one unit. The distribution shows that at the time of conducting the survey, 55.10% (747) work on a machine of Bulgarian production, 24.80% on imported units. Compared to 1996: 83.50%- bulgarian production : 10.20% imported (fig. 4, fig. 5) (6) (Катрова Л. Стоматологичната професия, състояние и перспективи, book, 1998, ISBN 954-90363-1-6, 290).

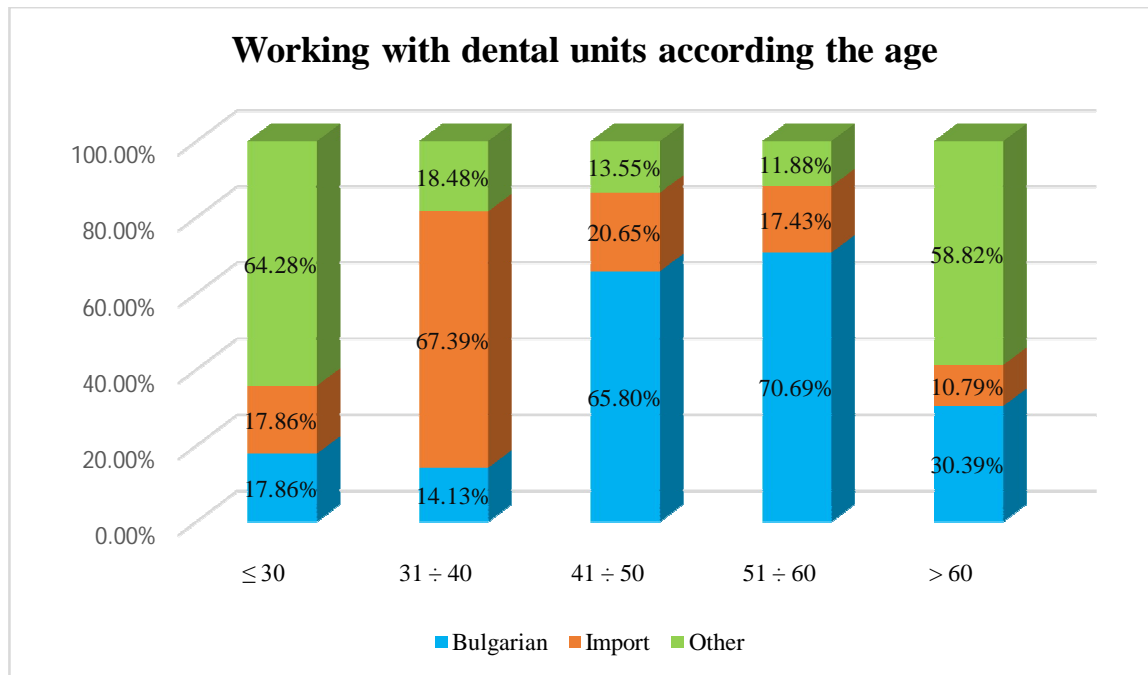


*FIG. 5 Distribution of the dental units according its origin*



*FIG.6 Distribution of the dental units according its origin, comparing for 2011 and 1996*

According to data from the survey, most of the dentists in the 41-50 and 51-60 age groups work with Bulgarian units, respectively 65.80% and 70.69%. Younger colleagues (31-40 years old) work in the greater number of cases of unit imports - 67.39%. It is interesting the fact that the youngest (under 30) and the oldest (over 60 years of age) share „the other“ answer - 64.28%, 58.82% (fig.7).



*FIG.7 Distribution of the usage of dental units according the age group of the dentis*

## Discussion and conclusion

The trend of technological innovation, staffing and development of the dental team is also confirmed by other studies of foreign authors (7, 8)

Two hundred sventy nine of answers or 22.66% have new dental units, 4.79% (59 DDM) have new X-ray devices, and 54.51% (671) have purchased new other equipment.

The number of practices relying on computerized data processing and electronic data exchange is increasing. 671 (56.21%) work with new computers. Such a trend is also observed in other European countries (M. Nasser) (7) .

If in 1996 8.6% of dentists had a computer, then according to the current study (2011), only in the last three years 56.21% have bought new computers. The renewal of equipment for the purpose of competitiveness and good dental practice is also proven by the data that in 1996 (6) 24.00% were working with units up to 10 years old, while in 2011, 50.92% of machines with the same age were working .

The equipment is also the basis for improving productivity, especially in the conditions of market-economic relations. Its renewal and improvement are part of the world's technological progress in every era (9). On the Bulgarian market there is a gradual renewal of machinery most of which is imported equipment (10, 11). With the increasing use of social networks and

computer technology, it leads to an increasing saturation of dental practices with computers of the latest generation. At the same time, communication between doctors and patients is improving, as well as between doctors themselves and them and commercial companies and other institutions. This determines at the same time the standard of good dental practice (12,13).

It is important to take into account the differences between the modern market and the previous - planning environment. With the change of the role of DDM, from employed by the state on a salary to being the responsible and interested in the development of his practice. In the condition of planned economy, complex and expensive equipment is purchased and maintained by the state. The government has also been paying for other consumables - electricity, water, heating, materials. And in these conditions, a better equipped office together with a more qualified doctor lead to a better quality of treatment. However, in those conditions the possibility of a discrepancy between the limited state resources and the initiative of the doctor is great. We have a contradiction between what the dental specialist wants as equipment and what the state provides.

In the conditions of 100% private practice, modernization depends on the financial capabilities of the doctor himself. From his initiative and entrepreneurship. Of course, here again we can see a discrepancy between what he wants and the possibilities for providing it. The costs in this case are solely at the expense of the practitioner. Therefore, the existence and development of dental practice depends primarily on profit, or income and expenditure balance (14). The private practitioner is required to know the legal requirements in the field of funding (15).

Seema Sharma states that for good modern dental practice, "business acumen is as important as clinical experience." According to her, dental practice has two goals: to provide excellent patient care and to generate income for the people who work in it. For the owner of the practice there is an additional goal: to invest in the sustainable development of the business, which may be sold at some point in the future. Modern dental practice needs:

- Increase in its capacity and production at all times to maintain and raising revenue;
- Reducing possible losses and maintaining and increasing profits;
- The dentist as a team leader to have an active approach to continuous training and improvement of their own and the staff's skills (16,17).

From the above, the tendency for modernization of the equipment in the private dental offices is clear. This is definitely dictated by the conditions set by the market economy. Without these conditions, competitiveness decreases, which reduces revenues and makes it much more difficult for the cabinet to self-finance.

The gradual increase in the number of owners of dental offices logically leads to the renewal of equipment and improvement of the material base - large private offices, new units, X-ray machines, etc. are been purchased. Modern dental practice is equipped with a growing range of equipment: ultrasound machine, autoclave, photopolymer lamp, iontophoresis machine, laser machine and others. The trend for technological innovation, staffing and development of the dental team is confirmed by other studies (7, 8). In newly purchased dental offices have been working 11.21% (138 respondents). With new dental units are working 22.66% (279 of the answers), 4.79% (59 DDM) are using new X-ray machines and 54.51% 671 have purchased new other equipment. The number of practices relying on computer data processing and web transfer is increasing sharply. With new computers have been working 671 (56.21%). This trend is also observed in other European countries (M. Nasser) (7, 18).

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Funding: This research received no external funding.

Conflicts of Interest: The author declare no conflict of interest