

Rate of use of the clinic dental materials of dentistry faculty of the University of Cuenca

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Abstract

Aim: To determine the rate of use of the dental materials in the areas of dental surgery, prosthodontics, periodontics, surgery, pediatric dentistry and orthodontics of Dentistry Faculty of the University of Cuenca, Ecuador.

Materials and methods: We analyzed the rate of use of 43 dental materials of the clinic of Dentistry Faculty of the University of Cuenca, the weight of these dental materials was obtained by a precision electronic scale to determine the number of doses, price per serving and usage fee.

Results: The rate of use of the glass ionomer for light-cured restoration in powder presentation is 5.6%, while in its liquid proportion its rate of use is 3.1%. Regarding to the composite resin, it has a paste form presentation, which has a 1.3% rate of use, in addition, the prophylactic paste and chlorhexidine at a concentration of 0.12%, have a rate of use of 0.5% and 0.1%, respectively.

Conclusions: Knowing the rate of use and price per portion of dental materials is very useful to take advantage of the materials performance, set appropriate prices for treatments and avoid high costs for patients.

Keywords: Dental materials; Rate of use; Price per portion; Management

1 Introduction

Currently, the demand for new health professionals, within the dental field, who seek to establish their own dental office or clinic has increased greatly, as everyone expects their company succeeds in the labor market. For this, knowledge about dental administration and management is necessary, whose objective is to improve or establish a services programming, a resources organization, personnel in charge of human talent, process control and the integration of strategies that allow to develop improvement actions for the dental consultation from the simplest to the most complex, so that all these resources are used efficiently [1].

Thus, dental administration and management directly influences the calculation of the rate of use of dental materials by helping us to know the number of portions that each one provides us and what is the cost for each portion used in dental treatment. Despite this, today there are several professionals who establish their costs without taking into account the real value of the portions used in each treatment, that is, the dumping effect is evident in them, defined as the continued practice of selling products and services below their cost, corrupting the ethics and morals that should be kept intact in every professional [2].

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Therefore, it is essential to take into account that the rate of use of materials will depend on how the professional in charge handles them, in some cases there is a lack of skill of the operator, which leads to material waste. In addition, it is possible to find patients who are very demanding in terms of their treatment and when their aesthetics are compromised, they seek greater detail, which if not fulfilled, could request the repetition of the activity, which leads to a greater expense of material [3].

For these reasons, the aim of this investigation is to determine the rate of use of dental materials used in the areas of dental surgery, prosthodontics, periodontics, surgery, pediatric dentistry and orthodontics of the clinic of the Dentistry Faculty of the University of Cuenca, Ecuador.

2 Material and methods

This is a descriptive, observational and cross-sectional article which was carried out in the different clinical areas of the Dentistry Faculty of the University of Cuenca, Ecuador. Specifically, it was worked in the clinical areas of dental surgery, with materials such as glass ionomer for restoration, composite resin, orthophosphoric acid, adhesive, calcium hydroxide, temporary restoration material, polishing paste; prosthodontics, with alginate, light silicone, medium silicone, provisional cement, definitive cement, hydrofluoric acid, silane, retraction cord, hemostatic agent; periodontics with prophylactic paste, chlorhexidine; endodontics, gutta-percha cones, accessory gutta-percha cones, paper points, sodium hypochlorite, EDTA, saline; orthodontics, band cementation material; pediatric dentistry, with sealant and eugenol, glass ionomer for cavity base, fluoride gel; and surgery, with topical anesthetic.

To calculate the rate of use, it is necessary to separate by fractions the recipients that contain their presentation in powder or paste such as alginate, silicone or composite and in the case of liquid materials, the drops must be counted for subsequent calculation. These materials were weighed with a precision electronic balance of the brand "BOECO BPS 40 plus" and the data obtained was recorded in a Google Sheets document, where formulas were generated to determine the number of doses, the cost per portion of material (CP) and the rate of use (RU), as follows.

2.1 Number of doses:

$$\Sigma D = \frac{TW}{WD}$$

Where ΣD is the number of doses; TW, total net weight; and WD, weight per dose.

2.2 Cost per portion

$$CP = \frac{CP}{\Sigma D}$$

Where CP is cost per portion; CP, commercial price; and ΣD , number of doses.

2.3 Usage rate

$$UR = \frac{1}{\Sigma D} \times 100$$

Where UR is cost of use rate and D, number of doses.

3 Results

In dental surgery, the materials used were glass ionomer for light-curing restoration in powder presentation, it has a rate of use of 5.6%, while in its liquid proportion its rate of use is 3.1%. Self-curing glass ionomer restorative has a rate of use of 1.7% per portion of powder and liquid of 0.8%. The composite resin used, in paste presentation, has a rate of 1.3%. Likewise, the orthophosphoric acid in its gel presentation contains a rate of use of 3.2% per portion; the adhesive in its liquid presentation has a rate of use of 0.6%, the calcium hydroxide in its catalyst presentation and paste form base has an equal serving rate of 7.9%. The temporary restoration material in its paste presentation has a usage rate per portion of 1.0%, the polishing paste of 3.4% (Table 1)

Table 1 Dental surgery and prosthodontics materials

	Brand	Presentation	Commercial price	Total weight	Weight / use per serving	Number of doses	Cost per serving	Usage rate per serving
Dental surgery								
Glass ionomer for restoration (light-cured)	GC corporation	Powder	27.08	5	0.281	18	1.52	5.6%
		Liquid		3	0.093	32		3.1%
Glass ionomer for restoration (self-cured)	GC corporation	Powder	31	10	0.169	59	0.52	1.7%
		Liquid		7	0.054	130		0.8%
Composite resin	Kerr	Pasta	25	4	0.05	80	0.31	1.3%
Orthophosphoric acid	Condac	Gel	2.5	2.5	0.079	32	0.08	3.2%
Adhesive	Kerr	Liquid	25	6	0.036	167	0.15	0.6%
Calcium hydroxide	Kerr	Catalyst Base	24.61	12	0.95	13	1.95	7.9%
				12	0.95	13	1.95	7.9%
Temporary restoration material	3M ESPE	Paste	11.86	28	0.285	98	0.12	1%
Polishing paste	FGM Dental Group	Paste	10	2	0.067	30	0.34	3.4%
Prosthodontics								
Alginate	Dencril Productos Odontológicos	Powder	4	454	21.526	21	0.19	4.7%
Light silicone	Kerr	Paste	53.12	64	5.091	13	4.23	8%
Medium silicone	Kerr	Paste	53.12	67	7.759	9	6.15	11.6%
Bisacryl	Vocco	Paste	150	75	0.45	167	0.9	0.6%
Oclufast	Shermack	Paste	44.66	50	5.899	8	5.27	11.8%
Provisional cement	Kerr	Paste	23.68	50	0.431	116	0.20	0.9%
				15	0.431	35		2.9%
Definitive cement	Kerr	Paste	36.15	5	0.349	14	2.52	7%
Hydrofluoric acid	Condac	Gel	8.48	3	0.087	29	0.30	3.5%
Silane	Ivoclar Vivadent	Liquid	78.87	5	0.044	114	0.69	0.9%
Retraction cord	Ultradent	Solid	14.5	244	4	61	0.24	1.6%
Hemostatic agent	Ultradent	Liquid	4.74	1.5	0.148	10	0.47	9.9%

Regarding the area of Prosthodontics, alginate in powder presentation has a rate of use of 4.7%, light silicone as a paste with its rate of 8.0%, medium silicone with 11.0 %. In addition, Bisacryl with its base and catalyst presentation form has a rate of use of 0.6% per serving portion; the Occlufast of 11.8%, the provisional cement of 2.9%, the definitive cement of 7.0%. Hydrofluoric acid as a gel with its rate of use of 3.5%; the silane with 0.9%. As for the retraction thread, it has a rate of use of 1.6%, the hemostatic agent in gel with 9.9%. In periodontics, dental materials such as prophylactic paste

and chlorhexidine at a concentration of 0.12%, have a rate of use of 0.5% and 0.1%, respectively. In the Endodontics area, we find the following rates of use. In the gutta-percha cones of 1.0%; accessory gutta-percha cones, 8.0%; paper tips, 8.3%; 5% sodium hypochlorite, 1.2%; EDTA, 9.3%; and physiological serum, 1.2% (Table 2).

Table 2 Periodontics, endodontics, orthodontics, pediatric dentistry and surgery materials

	Brand	Presenta- tion	Commer- cial price	Total weight	Weight / use per serving	Number of doses	Cost per serving	Usage rate per serving
Periodontics								
Prophylactic paste	Alpha Pro	Pasta	8.56	340	1.859	183	0.05	0.5%
0,12% chlorhexidine	Encident	Liquid	30.19	3.785	5	757	0.04	0.1%
Endodontics								
Gutta-percha cones	Becht	Solid	35.16	100	1	100	0.35	1%
Accessory gutta- percha cones	Becht	Solid	35.16	100	8	13	2.81	8%
Paper points	Becht	Solid	35.16	120	10	12	2.93	8.3%
5% sodium hypochlorite	Quimfar	Liquid	3	1.000	12	83	0.04	1.2%
EDTA	Eufar	Liquid	15.63	10.8	1	11	1.45	9.3%
Saline		Liquid	3.67	1.000	12	83	0.04	1.2%
Orthodontics								
Band cementation material	GC corporation	Powder	27.08	15	0.229	66	0.41	1.5%
		Liquid		10	0.134	75	0	1.3%
Pediatric dentistry								
Sealant	Ivoclar vivadent	Paste	27.75	1.25	0.057	22	1.27	4.6%
Eugenol	Eufar	Liquid	4.11	15	0.153	98	0.04	1%
Zinc oxide		Powder			0.94	0		
Glass ionomer for cavity base	WP dental	Pasta	33.69	2	0.05	40	0.84	2.5%
Fluoride gel	Eufar	Liquid	4.6	500	2.0	250	0.02	0.4%
Surgery								
Topical anesthetic	Zeyco	Gel	5.7	30	0.05	600	0.01	0.2%

In the same way, in the area of orthodontics we have glass ionomer to cement orthodontic bands, this has a usage rate of 1.5% for its presentation as powder and 1.3% for liquid. In pediatric dentistry, the sealant, one of 4.6%; eugenol, 1%; glass ionomer for cavity base, 2.5%; and fluoride gel, 0.1%. And finally, in Surgery, the topical anesthetic one of 0.6%.

4 Discussion

The administration of a dental clinic is essential for an adequate projection of the same, for this reason, when calculating the performance or capacity of a dental material, we allow ourselves to obtain exact values and know how much income, expenses, profits or losses we can get to have a dental appointment.

However, within the literature, despite of the fact that there are articles on dental administration, few works have been found that really show the rate of use of dental materials. One of them is the work of Villavicencio et al [3], carried out in Cuenca in 2018, where no bibliography was found either. In this way, when comparing it with the values of the rate of use obtained in the present study, they differ greatly, since it is assumed that this event can occur due to the fact that the net weight and the brand of the product used are different. Likewise, an influencing factor is the skill of the operators and dental assistants who dispense the material during the clinical process, which could modify the number of doses and therefore its rate of use.

With the light-cured restoration ionomer, we have a value of 5.6% in our study while Villavicencio et al [3] has a rate of 0.96%. As for García's research [4] the type of ionomer is not specified, but 3.3% is attributed to it. On the contrary, with the self-curing ionomer we obtained a similar value both in our investigation and in that of Villavicencio et al [3] being 1.7% and 1.75%, respectively. In the composite resin, a rate of 1.3% and a price per portion of \$0.31 was detailed, which compared to the study by Villavicencio et al [3] is lower since they obtained a rate of 3.28% with a price greater than \$0.81. In the same way, Hilario's study [5] reported a rate value quite similar to the previous one of 3.33%, but with a cost per portion of \$0.61. De La Mata Farro [6] mentions a rate of 6.7% with a price of \$1.13.

Orthophosphoric acid has a usage rate of 3.2% with its price per portion of \$0.08, while Villavicencio et al [3] highlight a rate of 2.83% with its cost of \$0.20. Similarly, García and De La Mata Farro [4,6] in their works have a usage rate of 2% with a fairly similar price of \$0.59 and \$0.58 respectively. On the contrary, Hilario [5] in his work has a lower rate compared to the previous ones, since it is 1.48% with a cost of \$0.02. Regarding the adhesive, we have a rate of 0.6% at a price of \$0.15, which compared to Villavicencio et al [3] is higher since they have a rate of 0.48% at \$0.06 per portion. Hilario [5] for his part, exposes a rate of 1.70% at \$0.13, which is considered higher at all rates compared to the investigations of García and De La Mata Farro [4,6] who have 1.3% at \$0.50 and 1.25% at \$0.49 respectively. Regarding calcium hydroxide, the value of the use rate is 7.9% at a cost of \$1.94, unlike Villavicencio et al [3] who have 1.25% at \$0.04 per portion. However, in the studies by García and De La Mata Farro [4,6] the values are identical for both the usage rate and the cost, ranging from 1.7% to \$0.05.

The temporary restoration material, also called Cavit, has a use rate of 1% with an amount of \$0.12, which corresponds to half of what was obtained in the studies by García and De La Mata Farro [4,6], with a rate of 2% to a cost of \$0.27 and \$0.26 respectively. In the same way, the polishing paste for composite resins reached a use rate of 3.4% at a price per portion of \$0.34, when contrasted with García and De La Mata Farro [4,6] is higher since they have their use rate. 2.5% at a cost of \$0.39 and \$0.38 individually.

Likewise, we found that the alginate has a use rate of 4.7% with a price of \$0.19 per portion, a price comparable to that found by Villavicencio et al [3] who report a use rate of 2.42% at \$0.18, however, is in stark contrast to studies conducted by De La Mata Farro [6] who reported a usage rate of 7.7% at \$0.48; García [4] one of 7.7% to \$0.49; and Hilario [5] one of 2.42% to \$0.67. On the other hand, the light silicone has a rate of 8% at \$4.23, but Villavicencio et al [3] report a rate of 1.12% at \$0.16; De La Mata Farro [6] one from 5% to \$0.97; García [4] one of 5% at \$0.99 and Hilario [5] one of 12.27% at \$2.16. For the medium silicone, we find a usage rate of 11.6% at a price of \$6.15, while De La Mata Farro [6] obtains values of 3.3% at \$1. The definitive cement, in the present study, has a rate of 7% with a price of \$2.52 per portion, which is only similar in price to the studies by Villavicencio et al [3] who report \$2.20, but a rate of 2.22%; and García [4] \$2.81 and a rate of 3.3%.

In relation to hydrofluoric acid or acid to prepare porcelain, the calculated rate of use is 3.5% at a value per portion of \$0.30, despite the fact that Villavicencio et al [3] highlight a rate of 12.65% at \$0.97. Likewise, silane has a rate of 0.9% at a price of \$0.69, when compared with Villavicencio et al [3] is much lower because a rate of 48% is found at \$0.24. The rate of use of the retraction cord in this study is somewhat similar to that of García [4] since 1.6% was found at \$0.24 and 1.1% at \$0.22, respectively. In the present study, the hemostatic agent has a usage rate of 9.9% at a price of \$0.47, however, De La Mata Farro [6] reports a rate of 1.3% at \$0.06.

With respect to the prophylactic paste, the use rate that we have obtained is 0.5% at a cost per serving of \$0.05; showing a very marked similarity with Villavicencio et al [3] who have a rate of 0.53% to \$0.05. However, García and De La Mata Farro [4,6] have a double rate, that is, from 1% to \$0.08. The 0.12% chlorhexidine mouthwash has a usage rate of 0.1% at a price per serving of \$0.04 which, compared to Garcia [4] is 1% at \$0.10. Similarly, the gutta-percha cones had a rate of 1% at \$0.35, which is classified as lower since García and De La Mata Farro [4,6] have a rate of 1.7% at a cost per serving of \$0.09. Likewise, with the accessory gutta-percha cones the calculated usage rate per serving is 8% at a price per serving of \$2.81, however, the Garcia and De La Mata Farro [4,6] rate is lower at 5% at \$1.08 and \$1.05 respectively. Paper points, meanwhile, had a usage rate of 8.3% at a cost per serving of \$2.93, while Garcia and De La Mata Farro [4,6] had a higher rate of 10% at \$0.42. On the other hand, the sodium hypochlorite that has been calculated in our study and in that of García [4] has a very similar rate with 1.2% and 1% respectively; but with a cost of \$0.03 and \$0.10. The cement for orthodontic bands is only evidenced in two studies, in ours the rate of use is 1.5% at a cost per portion of \$0.41, while Villavicencio et al [3] show a lower rate of 0.29% at \$0.12.

In the same way, pit and fissure sealants have a usage rate of 4.6% at a price per portion of \$1.27, even though Villavicencio et al [3] in their review highlights a rate of 2.67% at \$0.39 and Garcia [4] shows an intermediate rate of 1.7% at \$0.46. For its part, eugenol has a rate of 1% at a price of \$0.04, while Villavicencio et al [3] show a lower rate of 0.06% with a price per portion so low that it is rounded to \$0. Unlike García and De La Mata Farro [4,6] who have a rate of 0.2% with a value of \$0.01.

Regarding the glass ionomer for cavity base, in syringe presentation, in the present study it has a use rate of 2.5% with a value of \$0.84 per serving, while Villavicencio et al [3] report a use rate of 1.77% at \$0.52 but in the form of powder and liquid to mix. And fluoride gel has a usage rate of 0.4% at \$0.02 in the present study, but Villavicencio et al [3] report a usage rate of 1.24% at \$0.08; and García [4] a rate of 5.0% to \$0.28, coinciding with De La Mata Farro [6].

At the same time, the topical anesthetic obtains a usage rate of 0.2% at a cost per serving of \$0.01, which is lower when compared to De La Mata Farro [6] since they have a usage rate of 0.5 % with a cost of \$0.03.

On the other hand, when reviewing all the literature included in this study, it was shown that our study is the only one that calculates the rate of use and price of provisional cement at 0.9% at \$0.20; Bisacryl 0.6% at \$0.9; Oclufast 11.8% at \$5.26; 9.3% EDTA at a cost per serving of \$1.48; physiological serum at 1.2% at \$0.04.

Finally, it is important to mention that in the studies by García and De La Mata Farro [4,6] the values of the rate of use were not explicitly found, but the cost of the net weight of the material was established together with its yield, which contributed to the independent calculation of the cost per portion and therefore the rate of use to compare with the rest of the literature.

5 Conclusion

The correct administration of the dental clinic turns out to be very useful to quantify the rate of use of dental materials and their price per portion, so that it is possible to maximize the performance of the materials and set appropriate prices for treatments to avoid high costs to patients. In addition, incorporate the skill of calculating the rate of use of dental materials to the undergraduate study so that treatment costs are fair and equitable in the private practice within the labor field. Clinicians and researchers are encouraged to carry out more studies based on a greater proportion of materials, since the literature currently reports little evidence on the subject.

Limitations

The greatest limitation of the study was the lack of collaboration of the administrative staff of the clinic of the Dentistry Faculty of the University of Cuenca, since they did not allow us to use any dental material without prior request to the authorities, nor did they help us with dental bills of the materials purchased in this school year to have reference in this study. Despite this, the dental assistants gave us an approach with expired materials that are used in preclinical practices in dental phantoms. Regarding the costs of the materials, proformas were requested from the dental shop of the city, taking into account that the prices would be very similar to those of the faculty.

Compliance with ethical standards

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Disclosure of conflict of interest

There were no conflicts of interest in this research.

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