

# Quality of Final Impressions and Prescriptions for Fixed Prosthodontics

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## ABSTRACT

**Purpose:** The purpose of this study was to investigate the quality of final impressions and prescriptions for fixed restorations that were received by private and educational institute's laboratories in Sudan.

**Materials and methods:** Two hundred and seventeen questionnaires were distributed to eight private laboratories and seven dental schools in Sudan. The questionnaires were filled by the dental technicians and who were trained and instructed to complete one questionnaire per one final impression for fixed restoration immediately after it was received.

**Results:** Total response rate was 87%; the responding technicians had found evidence of obvious contamination in 23.8% of the examined impressions; blood was clear in 68.9% of these cases. Metal stock trays were used in 57.1% of the examined sample. About two-third of the impressions had been taken using condensation silicone (64.6%). Poor or no written instructions were observed in half of the sample (n = 103).

**Conclusion:** According to results of this study there was widespread use of inappropriate impression materials; the cross-infection control of sent impressions was below standard and there were poor prescriptions and communications with laboratory technicians in Sudan.

**Keywords:** Clinical restorative dentistry, Prosthodontics, Impression material, Laboratory prescriptions.

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## INTRODUCTION

It is well known in the literature that the quality of prosthetic restoration is a reflection of the skills of both the dentist and the technician and the communication between them.<sup>1,2</sup> Inadequate planning, designing or poor conveyance of these planning to the dental technician have many harmful drawbacks on the patient's oral and supporting structures.<sup>3</sup> There is strong evidence in the literature to set up on these potentially harmful effects of inappropriately designed removable and fixed prosthetic appliances.<sup>4,5</sup> Accordingly, a clear and effective communication between the dentist and the dental technician is considered a milestone in delivering a prosthetic appliance that satisfies all requirements. To produce an accurate final impression, which is a fundamental need in fabrication of accurate fixed prosthetic appliance; this

depends on the skills of the clinician as well as appropriate selection and handling of suitable impression materials and trays. There are many ethical obligations in European countries and United States to control and assess the quality of master impression and communication between the dental practitioners and the dental technicians. European Union's Medical Devices Directive concluded that it is the responsibility of the dentist to provide clear instructions for the production of prosthesis by the dental technician, who should then manufacture the prosthesis to the required specification.<sup>6</sup> The British Society for the Study of Prosthetic Dentistry advice that the design of any prosthesis is the duty and responsibility of the clinician; it also recommended that final impression be made using either a custom tray or a modified metal stock tray, and a dimensionally stable elastomeric materia.<sup>7</sup> Communication between the dental practitioners and the dental technicians and the decision on the type of restoration has been an issue in several countries, in the last 30 years a lot of investigations have been done in this area, most of them in European<sup>1,8-11</sup> countries and USA.<sup>12</sup> These researches predominately showed that the communications of design information was poor and there was extensive use of inappropriate impression materials and trays with the exception of a recent study conducted in Wales which has concluded that there was good practice in selection of impression materials and trays but the quality of the written instructions still unsatisfied.<sup>11</sup> Only few studies are available in the literature studying the quality of master impression and communication of fixed prosthetic appliances, most of these concluded a poor communication together with excessive use of inappropriate materials, trays and inadequate disinfection of the majority of the impressions as in UK,<sup>13-15</sup> and recently in Ireland<sup>2,16</sup> and Wales.<sup>17</sup> As there was a lack of information about the quality of final impression in Sudan, hence, the aim of this investigation was to assess the quality of final impression through evaluating the type of impression materials, impression trays and the status of contamination of final impression. Also, to identify the difficulties those were facing, the dental technician considering the communication with the dentist in general practice and in educational institutes.

## MATERIALS AND METHODS

A list of all registered commercial laboratories was obtained from the Ministry of Health, Khartoum state; there were

10 registered commercial laboratories beside eight dental schools. Precoded questionnaires in English and Arabic were distributed to eight commercial laboratories and seven dental schools in closed sealed bags. The questionnaires were filled by the dental technicians and they had been trained and instructed to complete one questionnaire per one final impression for fixed restoration immediately after it was received. All data was collected anonymously without recording the names of laboratories, dental schools, the dentist and technician. The requested information included the type of fixed restoration, status of contamination of the final impression, type of impression material and type of used tray. Concerning the quality of communications, the written instructions were classified according to the criteria that was previously published by Lynch and Allen<sup>16</sup> into:

- *Clear*: Adequately describe the planned fixed partial denture design/number and type of pontics/the abutment teeth/shade and shade map/specify the surface to be covered by metal only.
- *Guide*: Some of the design is left to the technician.
- *Poor*: Most of the design is left to the technician.
- *None*: No design instructions.

The data was analyzed using STATA version eight. Frequency distribution of each variable was analyzed using descriptive statistics. The significance level has been set ( $p$ -value < 0.05) and the two proportions Z-test was used to determine whether the difference between commercial laboratories group and dental schools group was significant. Chi-square test of association was used to determine if there was an association between quality of prescriptions and the requested prosthetic restoration.

## RESULTS

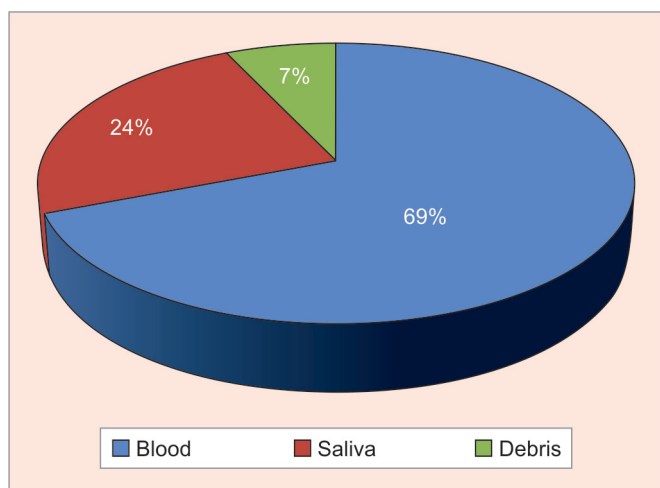
A total of two 217 questionnaires were distributed to 15 dental laboratories. Eight of the laboratories were private

while seven of them were in dental schools. One hundred and eighty-nine promptly completed questionnaires had been returned, making a total response rate of 87%. Ninety-four questionnaires were obtained from private laboratories (49.7%) and 95 from dental school (50.3%). About 76.2% of cases had no evidence of obvious contamination, while 23.8% of the impressions showed evidence of obvious contamination. The frequencies of reasons of impression contamination are summarized in Graph 1. Condensation silicone was used in 64.6% of the examined final impressions. About 32.8% of the final impressions were done by using alginate impression material while only 2.6% used additional silicone as a final impression material.

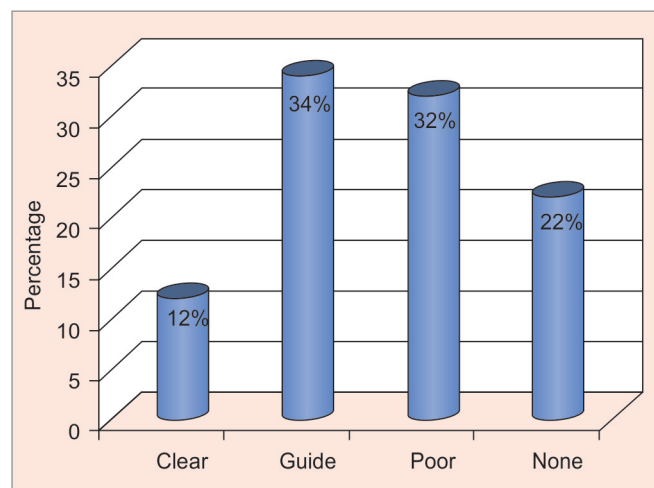
The quality of communication and written instructions are demonstrated in Graph 2. In 23.8% of the cases, the technicians were asked by the dental practitioners to construct the design of the fixed prosthesis while in 37.6% of the cases the technicians needed a clarification of the desired design from the dentist. Only 24.3% of the cases were provided with an interocclusal record. Cross tabulation of the results showed a significant association between quality of written instructions and type of fixed restoration ( $p < 0.019$ ) as shown in Table 1. The parametric z-test showed a highly significant difference between private and school dental laboratories in terms of the type of impression materials ( $p < 0.000$ ). Also, results showed a slight significant difference between the private and dental school laboratories in terms of impression trays ( $p < 0.045$ ) and a significant difference in terms of clear and guide written instructions ( $p < 0.001$ ,  $p < 0.01$  respectively) as shown in Table 2.

## DISCUSSION

The response rate of the present investigation was 87% which is considered adequate and comparable with responses obtained from similar previous studies.<sup>2,16,17</sup> The present



Graph 1: Causes of final impression contaminations



Graph 2: Frequencies of quality of written instructions

**Table 1:** Cross-tabulation between type of fixed prosthesis and quality of written instructions

Type of fixed prosthesis		Quality of written instructions				Total	Chi-square and p-value
		Clear	Guide	Poor	None		
Crown	Count	8	24	26	14	72	Chi <sup>2</sup> = 28.4 p-value = 0.019
	%	11.1	33.3	36.1	19.4	100.0	
Conventional bridge	Count	10	29	31	20	90	
	%	11.1	32.2	34.4	22.2	100.0	
Adhesive bridge	Count	1	5	3	2	11	
	%	9.1	45.5	27.3	18.2	100.0	
Hybrid bridge	Count	1	1	0	0	2	
	%	50.0	50.0	0.0	0.0	100.0	
Casted post and core	Count	0	5	1	6	12	
	%	0.0	41.7	8.3	50.0	100.0	
Implant	Count	2	0	0	0	2	
	%	100.0	0.0	0.0	0.0	100.0	
Total	Count	22	64	61	42	189	
	%	11.6	33.9	32.3	22.2	100.0	

**Table 2:** Comparison between private and dental school laboratories

Variable		Private dental laboratories (%)	Dental school laboratories (%)	Z	p-value
Impression material	Alginate	51	14.7	5.75	0.000
	Condensation silicone	44.7	84.2	-6.22	0.000
Impression tray	Plastic stock trays	48.9	36.8	1.69	0.0455
	Written instructions: clear	20.2	3.2	3.76	0.001
Written instructions	Written instructions: none	18.1	26.3	-1.36	0.0869
	Written instructions: poor	37.2	30.5	0.975	0.164
	Written instructions: guide	24.5	40.0	-2.312	0.0104
Impression contamination	Obvious contamination	27.7	20.0	1.2419	0.1075

results showed an inappropriate selection of impression materials, the condensation silicone was used in more than half of the sample (64.6%) followed by alginate in 32.8%; both alginate and condensation silicone are not recommended for fixed restorations due to their known dimensional instability.<sup>18,19</sup> Alginate was the principal choice for 32.8% of the requested cases which is in contrast with study that had been conducted by Mohamed and Abu-bakr in 2010 where the surveyed dentists indicated that alginate was the preferably final impression material (68.2%)<sup>20</sup> which may indicate some improvement in the attitude of selection of the final impression material. In spite that improvement; still condensation silicone is an unaccepted type of impression materials.<sup>18,19</sup> The results of this study contrasted with the trend in other international studies<sup>2,16,17</sup> where polyvinyl siloxane (PVS) was the most selected impression material for fixed restoration's final impression, in particular the study that was conducted by Jenkins et al where PVS was used in 100% of the cases.<sup>17</sup> Concerning the selected impression trays, plastic stock trays were used in 42.9% of the cases, this come into agreement with results obtained in a study conducted in Ireland by Lynch and Allen<sup>2</sup> which indicated the use of plastic stock trays in 54% of the cases while, in Wales, 79% preferred to use plastic trays.<sup>17</sup>

Contaminated dental impression is considered the principal potential route of transmission of infection from

a patient to a dental technician.<sup>21</sup> The disinfection of dental impression is an essential stage in cross infection control; however, there is great variation in the dental literature concerning the disinfection protocols and the type of suitable disinfectants. The disinfectant should achieve effective decontamination and, at the same time, it should not adversely affect the accuracy and stability of the impression material.<sup>21</sup> The most distinguished finding of the present investigation is that 23.8% of the examined impressions showed evidence of obvious contamination, in which blood was the most common feature of contamination (69%). The technicians detected that 76.2% of the impressions were not obviously contaminated; nevertheless, presence of no obvious contamination does not guarantee a proper disinfection of the impressions. The results from Lynch<sup>2</sup> and Jenkins<sup>17</sup> studies had revealed clear contamination in only 7% and 1% of cases respectively, which contrasted with the present investigation in which clearly contaminated cases amounted to 23.8%.

In agreement with worldwide trend, the quality of written instruction attitudes of Sudanese dental practitioners and dental students have revealed poor or no written instructions in approximately half of the cases (54.5%), guide instructions when some of design features were left for the technicians were detected in 33.9% of cases, beside only 11.6% of the instructions were considered as clear. Nearly,

the same results were obtained in Ireland 2005<sup>2</sup> and in the field of removable partial dentures in Wales<sup>11</sup> and Bahrain.<sup>22</sup> Recently, the studies that were conducted in Wales in 2009<sup>17</sup> and England in 2011<sup>23</sup> emerged adequate results, where poor and no written instructions had been detected in only 15% and 11% respectively, which reveal good awareness. From the present investigation, the unexpected results were that the Sudanese technicians had been directly asked to design the prosthesis in 23.8% of requested cases and 37.6% of cases needed more clarification from the dentist due to unclear features in the design. When comparing the results of private laboratories and dental schools, the trend in dental schools showed extensive use of condensation silicone (84.2%) and metal stock trays while the cases that were received in private practice showed more preference of using alginate (51%) and nearly equal results concerning the trend of use of type of trays as plastic stock trays were used in 48.1% of cases and metal trays were used in 51.1% of cases. No significant difference was found in the contamination status upon examination of impressions in private practice and dental schools. The results suggest that there were no big variations of the trend and quality of communication practiced by dentists in private clinics and the behavior in dental schools; however, the written prescriptions that were sent by the dentists tended to be slightly clearer than the prescriptions of the dental students. The opposite had been detected by Stewart in UK, who had discovered that the dental students were more accurate and clearer in their written prescription but, in general, there were no large difference between the two groups.<sup>24</sup> The phenomenon of abundant use of inappropriate impression materials and inadequate or absence of written instructions is not only restricted to Sudan but it is a worldwide condition. The reasons behind this attribute had been proposed in the literature as being based on financial and educational factors.<sup>1,2,8,10,11,16,17,22-24</sup>

## CONCLUSION

Within the limitation of this study, it has been found that there was an inappropriate selection impression material for taking final impression for fixed prosthesis. At the same time, there was selection of correct combinations of impression materials and impression trays. The status of contamination of the final impressions was inadequate as about one-sixth of the sample was obviously contaminated with blood which was the most common contaminant. The written instructions were considered poor or not present in the majority of the sample.

Mainly, there was a similar practice in dental schools and private clinic; however, the large difference existed in the choice impression material, the dental schools preferred condensation silicone while dentist in private clinics generally

used alginate for master impression for fixed prosthesis. There was noticed association between the type of restorations and the clarity of the written instructions, the more complex the restoration the more clear the written instructions.

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