

Adherence to Personal Protective Equipment Protocols: A Survey of Dentists in Khartoum's Teaching Hospitals, 2025

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ABSTRACT: For infection control in the high-risk dental environment, the use of Personal Protective Equipment (PPE) is not only crucial, but its correct and consistent use is a matter of urgency. A study in public teaching hospitals in Khartoum State, Sudan, and involved 117 General Dental Practitioners (GDPs) has revealed systemic problems in the use of PPE that could have serious consequences in the dental setting. According to the results, 74.4% of clinics lacked written infection prevention and control policies, and shockingly, only a 10.6% percentage of GDPs received adequate supplies of PPE. A whopping 88% staff hadn't any formal training in the use of PPE, and therefore, practitioner compliance to this is quite unpredictable. In one area, glove use was up to 91.5% but the instant removal of damaged gloves was just 54.7%.

The mask compliance was somewhat satisfactory, but, the procedure wasn't consistently executed; only 18.8% of the GDPs changed their wet masks between patients. Coming in last were protective eyewear with a deplorable 26.5% and gowns with a despicable 22.2% adherence. The general picture here is of PPE usage that is not up to par and is fundamentally undermined by the absence of clear policies, inconsistent access to equipment, and lack of training.



Keywords: Personal Protective Equipment, Infection Control, Compliance, Dental Practice, Cross-Sectional Study

1. INTRODUCTION

Providing dental care poses a often greater risk of transmitting infections than compared to most different healthcare facilities. This makes it essential to consider all patients as possibly transmissible and the simple principle for dental treatment. As a result, the first rule of infection control measures, peculiarly those involving the wearing of Personal Protective Equipment (PPE), has to be respected [1].

The findings of the research indicate that the probability of cross infection persists as a major problem with clinics even though these are well structured. The most pivotal thing to do in this case is to closely follow the steps for properly wearing and taking off PPE in order to minimize the risk of infection for practitioners [2].

The evidence of the need for PPE to cover the mucous membranes during the procedures that generate splash of spray is fantastic. According to a research in Jordan among the Military Dentists, the gross adherence was found to be pretty right and that specific, careful manuals, instructive sessions in a continuous format, and dependable supplies of PPE were the factors that needed to be in place for it to be sustained [3].

This is consistent with the OSHA requirement of wearing PPE by DHCP and keeping the exposure to blood borne pathogens as contemptible as moderate accomplishable [4].

One has to consider the expected exposure, fit, comfort, biocompatibility, longevity, and cost while selecting PPE. Even though thorough coverage gives the best protection, it is largely not practical. Therefore, the World Health Organization (WHO) suggests a risk based approach, where PPE is matched to specific procedures and suspected pathogens accordingly [2]. Despite the availability of established guidelines, achieving consistent orbicular compliance with private tutelary equipment (PPE) standards remains challenging, mostly due to continual gaps in knowledge, attitudes, and practices. In Brazil, dental students demonstrated the minimal compliance with tutelary eyewear use and

showed short biosafety awareness even after receiving training, highlighting the need for further intensive orientation, near monitoring, and better integration of infection control protocols within dental curricula [5].

A global review further confirmed considerable variability in compliance, reporting high adherence among newly qualified professionals in dependable regions, while systematically inferior levels were observed in developing countries [6]. In Jordan, improvements in PPE compliance were renowned among dentists; however, compliance among support staff remained limited. The authors emphasized the importance of targeted, hands on training programs for all staff, overseen by a dedicated infection control committee [7].

The COVID 19 pandemic further emphasized the critical role of PPE, particularly during aerosol generating dental procedures. In Saudi Arabia, PPE compliance among dental students improved following the World Health Organization's declaration of the pandemic, suggesting that increased risk perception and awareness can positively influence tutelary behavior [1].

In contrast, different studies reported ongoing deficiencies. In Yemen, undergraduate dental students exhibited bad compliance attributed to short PPE availability, carelessness, and a lack of continuous education, underscoring the need for orderly workshops and sustained training initiatives [8].

Similarly, studies from Lebanon's private dental sector revealed generally low compliance levels and insufficient knowledge of proper PPE use, indicating the necessity of identifying and addressing specific barriers to guideline implementation [9].

A survey conducted in Qatar found that PPE compliance was minimal during direct tolerant contact and varied importantly across expert groups, with pharmacists demonstrating inferior compliance compared to dentists and physicians [10].

In Sudan, research dating back to 2004 has systematically indicated the need to improve PPE compliance among dentists. Suggested strategies include the establishment of perspicuous infection control policies, stronger leadership commitment, and the enforcement of compulsory continuous expert education [11].

Further modern Sudanese research has reported suboptimal use of near PPE components, with the exception of gloves, and identified eye protection as the least utilized item. These findings highlighted a strong compliance gap and powerfully advocated for infection control education to be introduced as a required component of undergraduate training and uninterrupted throughout expert practice [12].

In conclusion, although the importance of PPE in dental practice is widely recognized, compliance remains incompatible across regions and expert groups. Better barriers include cost, discomfort, small availability of supplies, and short education. The near often proposed solutions involve integrating comprehensive; hardnosed infection control training at all stages of dental education, supported by robust institutional policies, dependable access to tutelary equipment, and continuous monitoring.

It is also essential to distinguish between self reported compliance in survey based studies and objectively observed compliance in clinical assessments, as this distinction has significant implications for data interpretation. Additionally, latent observer bias and limitations related to the generalizability of findings from special settings should be cautiously considered.

2. METHODOLOGY

A synchronic cross sectional study was conducted at the two public political dental teaching hospitals in Khartoum State, Sudan. The study population included all General Dental Practitioners actively working at these facilities who were registered with the Sudan Medical Council. Exclusion criteria eliminated houseman doctors, specialists, dental assistants, and those who declined participation. Given the lowly populations size of 117 suitable practitioners, a total coverage sampling method was employed.

The research examined PPE compliance operationalized as the observed and self reported adherence to hospital and standard infection control protocols for the correct type, use, and sequence of PPE as the dependent varied against autarkic variables of age, gender, and clinical experience. Data collection utilized both structured questionnaires and direct observation through an adapted CDC Infection Prevention Control checklist.

The instruments were pre-tested on a sample of 10 practitioners and refined for clarity, while data collectors received comprehensive two day training. Ethical approval was secured from institutional authorities, informed consent was obtained from all participants (which involved informing them of the study's experimental component) and data security measures were implemented.

The collected data were coded, analyzed using SPSS version 26, and presented through synchronic statistics in tabular and graphical formats. Special unconditional classifications (e.g. good/fair/poor) or a scoring system for gross compliance were not derived from the data; compliance was reported as percentages for singular PPE items and practices.

3. RESULTS

The demographic profile of the 117 study participants is presented in (table 1).

Table 1. - Participant Demographics (n=117)

Characteristic	Category	Frequency	Percentage (%)
Gender	Male	31	26.4
	Female	86	73.6
Age	25-30 years	49	41.9
	31-35 years	36	30.8
	35-40 years	22	18.8
	Above 40 years	10	8.5
Years of Experience	1-5 years	45	38.5
	6-10 years	41	35.0
	10-15 years	20	17.1
	15-20 years	11	9.4

The data in (table 2) reveals the state of institutional infection control infrastructure and general support. A majority of dental practitioners reported a lack of foundational resources, with 74.4% having no written IPC policies, 92.3% having no annual policy reassessments, and nearly 90% reporting lean supplies for standard precautions and right PPE. Near staff had received no instruction on PPE selection and use (88.0%), and 89.8% had no designated infection prevention coordinator.

Table 2. - Infection Control Policies and Infrastructure

Aspect	Response	Frequency	Percentage (%)
Written IPC Policies Available	Yes	30	25.6
	No	87	74.4
Policies Reassessed Annually	Yes	9	7.7
	No	108	92.3
Written Staff Immunization Policy	Yes	90	76.9
	No	27	23.1
Supplies for Standard Precautions Available	Yes	12	10.3
	No	105	89.7
Sufficient & Appropriate PPE Available	Yes	11	9.4
	No	106	90.6
Hepatitis B Vaccine Available Free of Charge	Yes	76	64.9
	No	41	35.1
Post-Vaccination Screening Available	No	117	100.0

Infection Prevention Coordinator Appointed	Yes	12	10.2
	No	105	89.8
Received Training on PPE Selection & Use	Yes	14	12.0
	No	103	88.0

While access to basic masks was broadly right (82.9%), availability of properly sized gloves was inconsistent, with only 47% always having them. For basic practices, a majority removed PPE before leaving the area (71.8%) and performed hand hygiene afterwards (68.4%). near changed gloves between patients (91.5%) and coats everyday (62.4%) (Table 3).

Table 3. - Self-Reported PPE Availability and General Practices

Practice	Response	Frequency	Percentage (%)
Enough Masks Available	Yes	97	82.9
	No	20	17.1
Proper Size of Gloves Available	Always	55	47.0
	Occasionally	42	35.9
	Never	20	17.1
Takes Off Coat When Leaving Clinic	Yes	70	59.8
	No	47	40.2
Frequency of Changing Coat	Daily	73	62.4
	Every Few Days	25	21.4
	Weekly	9	7.7
	Only When Contaminated	10	8.5

However, compliance was lower for different special precautions. Antiseptic glove use for surgery was 63.2%, direct removal of damaged gloves was 54.7%, and correct mask changing protocols were rare (only 18.8% changed between patients if wet). The use of different tutelary equipment was lower, with 26.5% wearing eye protection and 22.2% wearing tutelary gowns (Table 4).

Table 4. - Observed PPE Compliance Practices (Checklist)

Practice	Response	Frequency	Percentage (%)
PPE Removed Before Leaving Work Area	Yes	84	71.8
	No	33	28.2
Hand Hygiene After PPE Removal	Yes	80	68.4
	No	37	31.6

Wears Gloves for Potential Contact	Yes	76	65.0
	No	41	35.0
Changes Gloves Between Patients	Yes	107	91.5
	No	10	8.5
Wears Surgical Gloves for Examinations	Yes	117	100.0
Wears Sterile Gloves for Surgery	Yes	74	63.2
	No	43	36.8
Removes Torn/Cut Gloves Immediately	Yes	64	54.7
	No	53	45.3
Wears Mask During Splash-Generating Procedures	Yes	79	67.5
	No	38	32.5
Changes Mask Between Patients/If Wet	Yes	22	18.8
	No	95	81.2
Changes Mask at End of Clinical Session	Yes	29	24.8
	No	88	75.2
Wears Eye Protection/Face Shield	Yes	31	26.5
	No	86	73.5
Cleans Eye Protection After Each Patient	Yes	42	35.9
	No	75	64.1
Wears Protective Clothing (Gown)	Yes	26	22.2
	No	91	77.8
Changes Clothing If Soiled/Penetrated	Yes	69	59.0
	No	48	41.0

4. DISCUSSION

This study assessed compliance with Personal Protective Equipment (PPE) use among General Dental Practitioners (GDPs) in Khartoum State, a serious issue given the high infection risk in dental settings [13, 14]. All 117 approached GDPs participated. The workforce was preponderantly female (71 .8%) and adolescent (41.9% ripe 25-30), The demographic data , showing a preponderantly female and adolescent workforce , aligns with the profile of recent graduates, a group identified as being in a formative stage for establishing professional practices [15].This demographic profile contrasts with a Jordanian study where males were the majority [16].

- Systemic and Resource Deficiencies

Important general gaps were found. Near clinics (74 .4%) lacked written infection prevention and control (IPC) policies, and only 7.7% reported annual policy reassessment [17]. Although staff immunization policies were general (76 .9%) [18], serious resources were scarce: only 10.3% of GDPs reported having supplies for standard precautions and only 9 .4% confirmed comfortable PPE availability. These figures are lower than those among

Nigerian dentists [19], promising due to the absence of a comprehensive national infection control program for dental clinics in Sudan [20].

- Training Gaps

Participants reported poor training in general IPC principles and specific PPE use [21], a fundamental barrier to compliance [22].

- Compliance Outcomes: Self-Reported vs. Observed

Compliance varied by PPE type. It is important to differentiate between self-reported practices (collected via survey) and the single observed measure noted in the study [23].

- Changing gloves between patients was also high (91.5%) [24]. However, compliance was lower for wearing gloves during latent blood contact (65%), using antiseptic gloves for surgery (63.2%), and instantly removing damaged gloves (54.7%).

- Masks: Despite comparatively right access (82.9%), self reported mask wearing during procedures generating fluids was moderate (69.5%) [25]. crucially, protocol adherence was poor: 81.2% did not change masks between patients or when wet and 75.2% did not change them at the end of sessions [26].

- Eye Protection: This was the most neglected area. Only 26.5% reported wearing protection during insecure procedures [27]. Of those, only 35.9% reported cleaning/disinfecting it after each patient [28], antonymous to guidelines for reusable PPE [29].

- Protective Clothing: Self reported use of protective gowns was low (22.2%) [30]. although 62.4% of those wearing coats changed them daily, 40.2% reported not removing them when leaving the clinic a basic protocol breach [31].

- Observed Practice: On a optimistic note, direct observation recorded that 71.8% of participants removed all PPE before leaving work areas, and 68.4% were observed performing hand hygiene instantly afterward [32].

5. LIMITATIONS

This study has several limitations. The use of direct observation, while strengthening data validity, carries the potential for the Hawthorne effect, where participants may alter their behavior because they are knowledgeable of being observed, possibly leading to an overestimation of compliance rates. The cross sectional design limits the ability to establish causal relationships between the identified factors and compliance levels. Furthermore, the study was conducted in two better teaching hospitals in Khartoum; therefore, the findings may not be generalizable to private clinics, rustic settings, or different regions within Sudan.

6. CONCLUSION

Based on the study, while compliance with glove usage was broadly good, an important weakness was identified in the timely removal of gloves when they were torn, cut, or punctured. Regarding different private tutelary equipment, the investigation found only moderate compliance with the use of masks and coats, and an unfavorable attitude toward the use of face shields. Furthermore, the study concluded that key factors affecting gross PPE compliance were deficient, chiefly due to the lack of a perspicuous Infection Prevention and Control (IPC) policy and weak training programs.

7. RECOMMENDATIONS

- Implement ongoing professional development: Establish compulsory continuous professional development (CPD) programs to ensure the consistent dissemination of current, evidence based hardnosed knowledge for infection prevention and control.
- Revise educational curricula: Conduct a comprehensive review and modernization of all dental school curricula to integrate and reinforce contemporary infection control standards and protocols.
- Standardize and document PPE procedures: Mandate the demonstration and formal documentation of correct Personal Protective Equipment (PPE) protocols to ensure procedural uniformity and accountability.
- Establish a compliance monitoring system: Create a robust supervisory and auditing framework to systematically monitor adherence, provide feedback, and reinforce the consistent application of recommended practices.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest

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