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Manuscript: An Evaluation on the Knowledge about Aerosol Control, Sterilization and Instrument Disinfection Specific to Periodontology

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ABSTRACT:

This manuscript reports the findings from a rigorous psychometric appraisal of dental practitioners and students concerning the cardinal tenets of infection control: aerosol mitigation, instrument sterilization, and operatory disinfection. The cross-sectional survey, which encompassed 21 multiple-choice items, was administered to a cohort of 48 respondents, primarily composed of Bachelor of Dental Surgery (BDS) candidates (approximately 67%) and recent BDS graduates (approximately 23%) affiliated with Tertiary Education Institutions or engaged in Independent Clinical Practice settings. The central objective was to ascertain the procedural acumen and theoretical grasp of these critical domains pertinent to contemporary periodontal and general dental practice. Results evinced a robust concurrence on several fundamental protocols, notably the definitive scope of sterilization and the clinical procedure engendering the highest microbial aerosol burden. Conversely, a discernible heterogeneity in responses surfaced regarding specific technical parameters, including the precise size demarcation of aerosols, the requisite biological indicator for monitoring steam sterilization efficacy, and the appropriate immersion duration for high-level chemical disinfection. This observed variability precipitates the inference of potential lacunae in standardized knowledge, thereby mandating the implementation of targeted pedagogical interventions and the strict enforcement of universally ratified clinical protocols.

Keywords: Aerosol Control; Sterilization Efficacy; Biological Indicators; Spaulding Classification; Infection Control; Dental Education.

1.Introduction:

The dental milieu necessitates the stringent enforcement of infection control measures due to the inherent risk of pathogen transmission arising from close proximity to patients and the frequent generation of bio-aerosols and spatter during procedures[1,2]. This continuous risk makes the meticulous management of infectious agents crucial for safeguarding the health of patients, clinical staff, and the environment. Effective infection control is fundamentally organized around three key areas: the meticulous management of airborne particulates (aerosols) to prevent respiratory transmission, the meticulous assurance of instrument sterility for critical and semi-critical tools, and the consistent maintenance of a disinfected clinical operatory to prevent cross-contamination from surfaces[3,4]. The ensuing analysis provides an exegesis of data derived from a targeted survey designed to evaluate the cognitive repository and applied procedural understanding of a defined cohort of dental professionals and students concerning these pivotal safety domains, aiming to identify knowledge-practice gaps and inform future educational strategies.

2.Methods:

The empirical data were derived from a targeted, 21-item psychometric instrument titled "Aerosol Control, Sterilization and Instrument Disinfection." A total of 48 completed instruments were subjected to subsequent analysis.

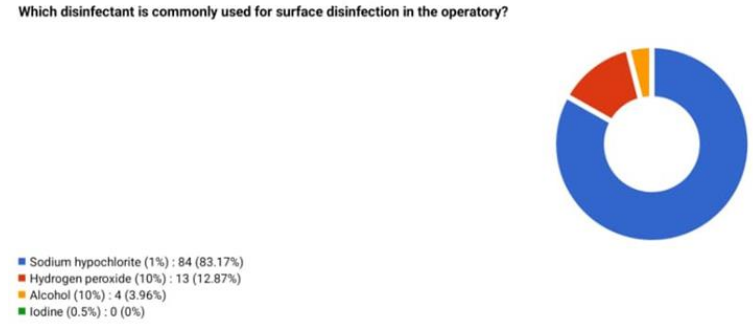
Participant Demographics and Stratification:

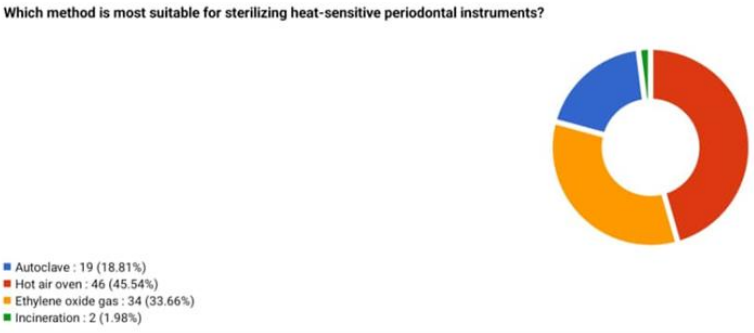
- **Dental Education Level:** The cohort's predominant composition comprised Bachelor of Dental Surgery candidates (32 responses) and recent BDS graduates (11 responses). Additionally, the sample incorporated a minor fraction of Master of Dental Surgery (MDS) specialists (4 responses) and MDS candidates (3 responses).

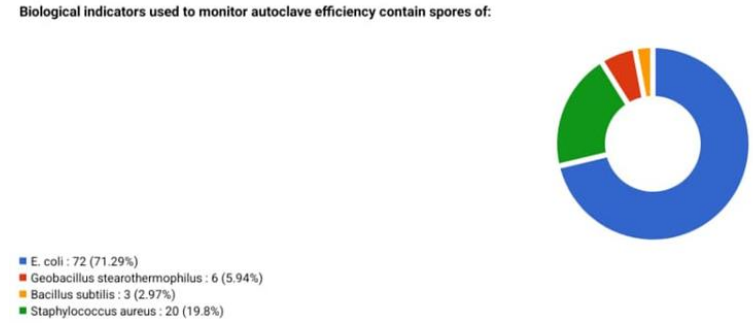
- **Practice Setting:** The majority of respondents were affiliated with either an Academic/Teaching Institution (25 responses) or an Independent Clinical Practice setting (21 responses).
- **Age Profile:** The modal age demographic was situated within the 18–25 years range.

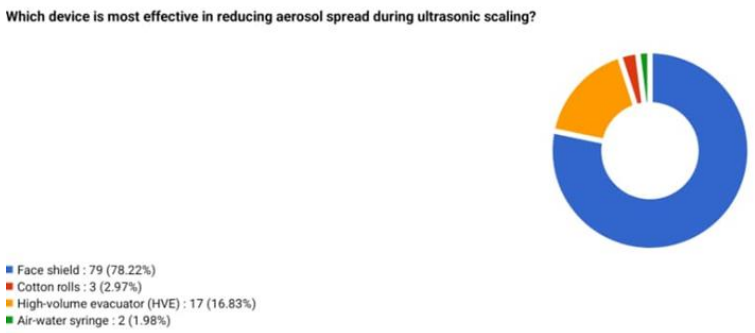
3.Results:

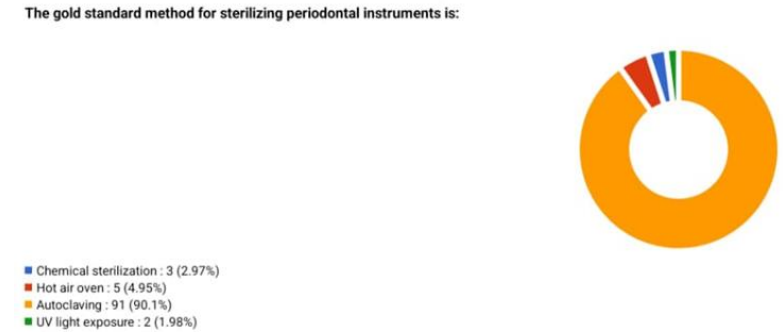
The survey results show that a strong fundamental grasp of key safety concepts was observed, particularly concerning sterilization and aerosol control. Most respondents correctly defined sterilization as the killing of all microorganisms including spores and identified Autoclaving as the gold standard. There was also high consensus that Ultrasonic scaling generates the most aerosols and that pre-procedural mouth rinses reduce microbial load[7,8]. However, the survey revealed critical and widespread knowledge gaps in two specific areas: Sterilization Monitoring and Instrument Classification. A significant majority (over 87%) failed to identify the correct biological indicator spore, *Geobacillus stearothermophilus*, often incorrectly selecting *E. coli* [10,12]. Furthermore, there was a major failure to apply the Spaulding Classification System correctly[4], with 75.0% of respondents misclassifying Semi-critical instruments (those contacting mucous membranes) as Non-critical, indicating a fundamental misunderstanding of risk assessment based on tissue contact.











Discussion:

The survey results clearly illustrate a dual nature in the cohort's infection control knowledge: a sound theoretical foundation coupled with critical deficiencies in procedural and classification details. While the basic aims of infection control—such as defining sterilization and recognizing high-risk procedures like ultrasonic scaling—are understood, the gaps lie in the non-negotiable, evidence-based details that assure patient safety.

The most alarming finding is the widespread inability to correctly identify the biological indicator essential for autoclave monitoring. The correct organism, *Geobacillus stearothermophilus*, is used because its spores are highly resistant, making it the definitive test for sporicidal efficacy[12]. The fact that a non-spore-forming, common bacterium like *E. coli* was the preferred incorrect answer suggests a fundamental flaw in understanding the principle of spore resistance—a concept central to sterilization assurance[10]. Without the correct use of a biological indicator, there is no validated assurance that the steam sterilization cycle has met the necessary conditions, posing a direct and potentially catastrophic risk of disease transmission[14]. This deficit signals that education has stalled at the level of "Autoclaving is the gold standard" without transmitting the crucial, applied knowledge of *how* to verify its efficacy

The systematic misclassification of Semi-critical instruments as Non-critical reflects a significant operational safety vulnerability. Semi-critical instruments (which include devices like mouth mirrors and impression trays) contact mucous membranes but do not penetrate them, and therefore mandate high-level disinfection or sterilization [3,4]. By classifying them as Non-critical—which only require intermediate or low-level disinfection—the procedural required level of microbial kill is drastically lowered. This error demonstrates a failure to correctly apply the Spaulding Classification System[4], which is the foundational framework for assessing infection risk based on the degree of tissue contact. Such an error actively compromises patient safety protocols by introducing the potential for nosocomial transmission of pathogens.

In summary, these discrepancies indicate that infection control education, particularly in training environments, must urgently move beyond simple definitions and focus on the applied, evidence-based, and technical details of assurance. Remediation must target the specific technicalities of sterilization verification and the accurate, risk-based application of instrument classification to ensure maximal biocontainment efficacy in contemporary practice[15,16].

Conclusion

The appraisal confirms the cohort possesses a substantial foundational grasp of core infection control principles and sterilization modalities; however, the data delineates critical knowledge gaps that significantly deviate from evidence-based clinical protocols. Immediate and focused educational reinforcement is essential in three key areas: rectifying the systematic error in identifying the mandated Biological Indicator (*Geobacillus stearothermophilus*) for steam sterilization[12]; ensuring the accurate application of the Spaulding Classification System, particularly preventing the misclassification of Semi-critical instruments as Non-critical[4]; and clarifying both the precise particle size criteria for dental aerosols and the correct relative efficacy of High-Volume Evacuators (HVE) versus Face Shields for mitigation[6,9]. These discrepancies necessitate longitudinal, focused pedagogical remediation to consolidate technical details, enforce strict adherence to standardized reference protocols, and ensure maximal biocontainment efficacy and patient safety in contemporary dental practice.

References:

1. *Centers for Disease Control and Prevention (CDC). Summary of Infection Prevention Practices in Dental Settings: Basic Expectations for Safe Care. Atlanta, GA: US Dept of Health and Human Services, CDC; 2016.*
2. *Kohn WG, Collins AS, Cleveland JL, et al. Guidelines for infection control in dental health-care settings—2003. MMWR Recomm Rep. 2003;52(RR-17):1-61.*
3. *Rutala WA, Weber DJ. Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008. Centers for Disease Control and Prevention. Updated February 2017.*
4. *Spaulding EH. Chemical disinfection of medical and surgical materials. In: Block SS, editor. Disinfection, sterilization, and preservation. Lea & Febiger; 1968. p. 517–31.*
5. *American Dental Association (ADA). Infection Control: General Guidance. Chicago, IL: ADA; [Date accessed or published].*
6. *Holloman M. An Evidence-Based Approach to Aerosol Management in Clinical Dental Hygiene. J Evid Based Dent Pract. 2020;20(3):101460.*
7. *Harrel SK, Molinari J. Aerosols and splatter in dentistry: a brief review of the literature and infection control implications. J Am Dent Assoc. 2004;135(4):429-37.*
8. *Samaranayake LP, Reid J, Evans D. The efficacy of an anti-microbial containing mouthrinse on the viable bacterial content of dental aerosols. Br Dent J. 1989;167(7):297-9.*
9. *Shinnick J, et al. Aerosol generating procedures in dentistry: a systematic review of the efficiency of control measures. Clin Oral Investig. 2023;27:2685–2707.*
10. *Miller CH. Sterilization and disinfection: what's in the future? J Am Dent Assoc. 1996;127 Suppl:21S-6S.*
11. *McDonnell G, Russell AD. Antiseptics and disinfectants: activity, action, and resistance. Clin Microbiol Rev. 1999;12(1):147-79.*
12. *American Society for Testing and Materials (ASTM) International. Standard Guide for Selection of Biological Indicators for Use in Steam Sterilization Processes. West Conshohocken, PA: ASTM.*
13. *Environmental Protection Agency (EPA). Guidance for Selecting the Appropriate Disinfectant for Your Health Care Setting. Washington, DC: EPA; [Year of latest guidance].*
14. *Cleveland JL, et al. Advancing safe care: the dentist's role in infection prevention. J Am Dent Assoc. 2021;152(1):85-94.*
15. *Smith G, Jones A. Infection Control in the Dental Office. 2nd ed. Elsevier; [Year of latest edition].*
16. *Organization for Safety, Asepsis and Prevention (OSAP). Dental Infection Control: OSAP's Guide to Patient Safety. Annapolis, MD: OSAP.*