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Diagnostic Performance and Durability of a Modified Papanicolaou Staining Method for Cervical Screening: A Cost-Effective Method for Resource-Limited Settings

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Background: This study investigates the efficacy of a modified Papanicolaou staining method for cervical screening, currently practiced at DGH Matara, Sri Lanka, as the conventional method requires a high amount of alcohol.

Objective: To assess the cytomorphological efficacy and archival durability of the modified Papanicolaou staining method through prospective and retrospective analyses.

Methods: A prospective study (Sept–Nov 2023) analyzed 161 cervical smears from MOH areas in Matara. Paired smears were stained using both conventional and modified Papanicolaou method. The modified method involved replacing the alcohol series for hydration with 70% alcohol. After staining with Harris' hematoxylin and rinsing with tap water, differentiation step in 0.5% HCl and dehydration step with an alcohol series were omitted. Tap water replaced the use of 95% alcohol for rinsing after staining with OG6 and EA50. Slides were blindly assessed by the investigator, two cyto-screeners, and the consultant histopathologist using a standard scoring system, and Quality Index (QI) was calculated. For the retrospective study, 250 modified method slides (50 per year, 2018–2022) were randomly selected. Reference smear chosen per IARC/IAC Atlas. QI calculated and five-year differences analyzed using ANOVA.

Results: Of 152 satisfactory smears, distinct cytoplasmic borders were seen in 98.7% in conventional and 96.7% in modified method. Satisfactory cytoplasmic staining was 60.5% and 57.2%, respectively. Nuclear features were consistently preserved in both methods. QI was 0.932 in conventional and 0.911 in modified method with no significant difference ($p > 0.05$). The modified method decreased costs by 80% by minimizing the use of alcohol. In the retrospective analysis, smears from 2018 to 2022 showed QI values ranging from 0.870 to 0.909. No significant decline ($P > 0.05$) in cytomorphological quality occurred, supporting method's stability and reliability.

Conclusion: The modified Papanicolaou method is a cost-effective, reliable, and stable alternative for cervical screening in low-resource settings.

Keywords: Archival stability, Cervical smear, Cytomorphology, Modified Papanicolaou stain, Quality index