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НОВЫЙ ДЕНЬ В МЕДИЦИНЕ
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ДЛИТЕЛЬНОЕ КЛИНИЧЕСКОЕ НАБЛЮДЕНИЕ РАННИХ КАРИОЗНЫХ ПОРАЖЕНИЙ У ДЕТЕЙ С ДИАБЕТИЧЕСКОЙ ПОЛИНЕЙРОПАТИЕЙ: 12-МЕСЯЧНЫЙ ПРОСПЕКТИВНЫЙ ПРОТОКОЛ

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✓ ***Резюме***

В статье изложен стандартизированный протокол 12-месячного наблюдения некавитированных и ранних кариозных поражений у детей с диабетической полинейропатией. В проспективную контролируемую когорту включены 130 детей 7-15 лет: 85 детей с кариесом на фоне диабетической полинейропатии и 45 здоровых детей, сопоставимых по возрасту. Клиническая когорта разделена на подгруппу традиционной профилактики (n=40) и подгруппу мультидисциплинарной профилактики (n=45). Исходное обследование включает КПУ/КПУ поверхностей, OHI-S, ICDAS II, лазерную флуоресценцию 655 нм, индикацию 2% метиленовым синим и анализ слюны. Через три месяца оцениваются соблюдение рекомендаций и индикация очагов, через шесть и двенадцать месяцев - прирост кариеса, стадия ICDAS и выбранные показатели ротовой жидкости.

Ключевые слова: диабетическая полинейропатия, дети, ранний кариес, длительное наблюдение, ICDAS II, лазерная флуоресценция, слюна

Introduction

Early caries control is not a single-visit procedure. A white-spot lesion may become less active after professional cleaning and improved home care, remain unchanged, or progress despite an apparently appropriate recommendation. This uncertainty is especially important in children with diabetes, because salivary protection, dietary patterns, plaque control and metabolic status may change over time. A longitudinal protocol is therefore more informative than an isolated examination: it asks not only whether a lesion is present, but whether it remains biologically active under everyday conditions [2-6].

The conventional DMFT index remains valuable for describing accumulated caries experience, although it is relatively insensitive to the earliest enamel changes. ICDAS II extends the clinical record to noncavitated lesions, while laser fluorescence can provide an adjunctive numerical signal after the surface has been cleaned and dried. Salivary findings add information about the oral environment, but their value depends heavily on standardized collection and interpretation. When these components are repeated at predefined intervals, the clinician can distinguish a durable preventive response from a short-lived improvement [7-11].

The present article focuses on follow-up methodology rather than claiming treatment superiority. This distinction is essential because the clinical subgroups are formed in routine practice without random allocation. The purpose of monitoring is to document comparable change within each pathway, identify children who need escalation of preventive care, and prepare a reliable basis for later comparative-effectiveness analysis.

Purpose of the study: to develop a standardized 12-month clinical monitoring protocol for early carious lesions in children with diabetic polyneuropathy and to define reproducible examination points, response criteria and rules for modifying preventive care.

Materials and methods

The study is conducted at the dental clinical base of Bukhara State Medical Institute from 2022 to 2026 as an observational, controlled, non-randomized prospective cohort. A total of 130 children aged 7-15 years are enrolled. The clinical cohort includes 85 children with dental caries associated with diabetic polyneuropathy; the control cohort includes 45 age-comparable healthy children. Written informed consent is obtained from parents or legal representatives before clinical and laboratory procedures.

The clinical cohort follows two preventive pathways. Subgroup 1-A (n=40) receives professional cleaning and a conventional fluoride-varnish protocol consisting of three applications at 3-4-day intervals. Subgroup 2-B (n=45) receives professional biofilm removal, lesion indication with 2% methylene blue, individualized diet and oral-hygiene counselling, and a 14-21-day course of Asepta Minerals remineralizing gel. The healthy control group (n=45) provides an age-comparable reference for standardized clinical and salivary measurements.

Table 1. Examination schedule during the 12-month observation period

Assessment	Baseline	After course	3 months	6 months	12 months
DMFT/DMFS	+	-	-	+	+
OHI-S	+	+	+	+	+
ICDAS II	+	target lesions	+	+	+
DIAGNOdent	+	if indicated	if indicated	+	+
2% methylene blue	+	target lesions	+	if indicated	if indicated
Salivary variables	+	-	selected	selected	+
Adherence/tolerability	+	+	+	+	+

Standardized baseline examination

At baseline, the dentition is examined in a fixed sequence after professional cleaning. Caries experience is recorded as DMFT for permanent teeth and DMFS for affected surfaces. Oral hygiene is assessed with OHI-S. Within the study protocol, 0-0.6 indicates good hygiene, 0.7-1.6 satisfactory hygiene, 1.7-2.5 unsatisfactory hygiene and a value above 2.6 poor hygiene. These ranges are used consistently at all visits so that an apparent improvement reflects a real change rather than a change in interpretation.

ICDAS II is recorded on a clean surface, first viewed wet and then after five seconds of air drying. Codes 1 and 2 identify early enamel changes that remain candidates for non-operative management; codes 3-6 require renewed assessment of surface integrity and dentinal involvement. DIAGNOdent is used as an adjunct at 655 nm. Working thresholds are 0-13 for sound enamel, 14-24 for an early enamel-level change and 25 or more for probable dentinal involvement. Plaque, stain and residual restorative material are removed before scanning because they may raise fluorescence values.

Unstimulated saliva is collected between 08:00 and 11:00 after at least two hours without food, drink, toothbrushing or mouth rinsing. Flow rate, pH, viscosity and buffering are assessed, followed by biochemical, microbiological and immunological analysis when scheduled. The panel includes calcium, phosphorus, the Ca/P ratio, alkaline and acid phosphatases, malondialdehyde, superoxide dismutase, catalase, Streptococcus mutans, Lactobacillus and secretory IgA. No single salivary marker is treated as a diagnostic verdict [8,10,11].

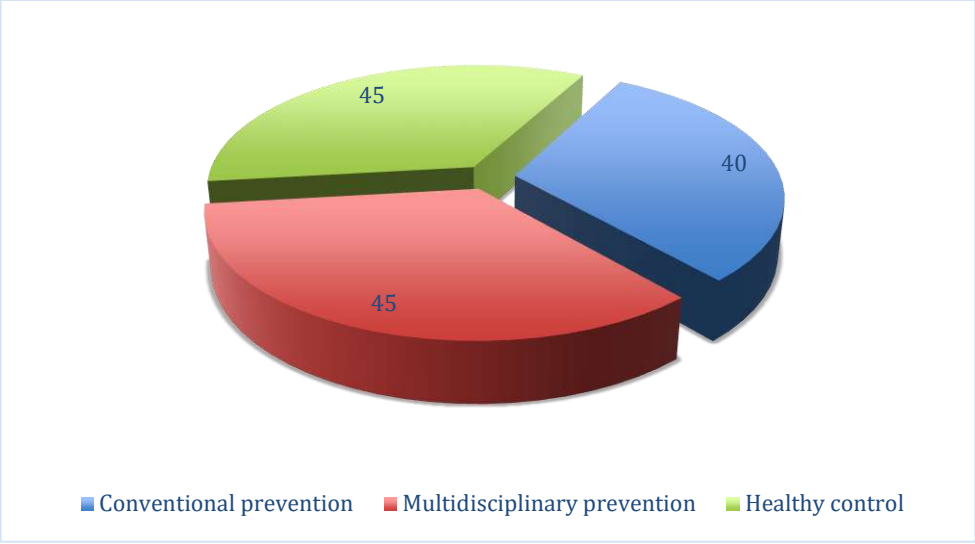


Figure 1. Distribution of children across the study pathways (n)

Structure of the clinical pathways

The distribution of participants across the three study pathways is shown in Figure 1. The figure is intentionally based on verified cohort numbers rather than treatment outcomes, which are not available in the submitted material. In Word, the chart data can be opened and edited through the chart's data-editing command.

Rules for interpreting longitudinal change

A favourable short-term response is not defined by colour change alone. For an early lesion, improvement requires concordant clinical evidence: the surface becomes harder and smoother, plaque stagnation is reduced, the ICDAS stage does not progress, and adjunctive readings remain stable or move toward a lower-risk range. Methylene-blue uptake may decrease as porosity declines, but staining is interpreted only after identical cleaning, isolation, application time and rinsing.

Stability means that the lesion remains noncavitated and clinically inactive without new high-risk findings. Progression is recorded when an ICDAS code increases, a previously intact surface develops breakdown, dentinal involvement becomes clinically plausible, or a new lesion appears. A numerical DIAGNOdent change is considered meaningful only when the same device, tip, calibration and surface conditions are used. Where clinical and optical findings disagree, repeat assessment is preferred to an immediate irreversible procedure.

Table 2. Lesion-level response criteria and the corresponding clinical decision

Response category	Clinical and adjunctive pattern	Recommended action
Favourable response	No ICDAS progression; surface appears inactive; hygiene improves; adjunctive findings are stable or lower	Continue home care and the planned risk-based recall interval
Stable lesion	Noncavitated lesion remains unchanged; no new high-risk feature	Maintain prevention and reassess at the next scheduled visit
Uncertain change	Visual, dye and fluorescence findings are discordant or collection conditions differ	Repeat the examination under standardized conditions before escalation
Progression	Higher ICDAS stage, surface breakdown, probable dentinal involvement or a new active lesion	Intensify prevention and consider minimally invasive restorative care
Systemic/behavioural deterioration	Reduced saliva protection, poorer hygiene, frequent sugar exposure or unstable medical control	Shorten recall and coordinate care with the paediatric/endocrine team

Follow-up visits

The post-course review assesses whether the child and caregiver can perform the prescribed home procedure, whether the product is tolerated and whether plaque control has improved. At three months, lesion indication with methylene blue and OHI-S are repeated, with ICDAS II focused on previously mapped lesions. This visit is early enough to correct technique before a preventable lesion progresses.

At six months, the examination expands to DMFT/DMFS, ICDAS II, oral-fluid pH and selected salivary variables. The aim is to detect new disease experience and determine whether the preventive behaviour has become routine. At twelve months, the full clinical-laboratory assessment is repeated under conditions comparable with baseline. The final annual decision is based on the entire trajectory rather than the last measurement alone.

Children with active ICDAS 1-2 lesions, unsatisfactory OHI-S, reduced salivary flow, acidic pH or increased cariogenic bacterial load require a shorter recall and reinforced professional care. By contrast, a child whose lesions remain inactive, hygiene is consistently good and salivary protection is stable may continue with maintenance prevention. The protocol therefore allows intensity to decrease as well as increase, provided that the evidence is consistent.

Statistical analysis

Data are entered in Microsoft Excel 2010 and analysed in IBM SPSS Statistics version 23. Distributional assumptions for quantitative variables are checked with the Kolmogorov-Smirnov test together with skewness and kurtosis. Normally distributed data are summarized as mean, standard deviation, standard error and 95% confidence interval; Student's t-test is used when its assumptions are met. Categorical findings are reported as absolute counts and percentages. Non-parametric methods are selected where necessary, and statistical significance is set at $p<0.05$.

Because allocation is non-randomized, later outcome analysis should report baseline comparability and within-group change before interpreting between-group differences. Repeated observations from the same child are not independent; therefore, an analysis plan for final results should also account for paired or repeated measurements. Clinical importance should be presented alongside p-values, particularly for new lesions, ICDAS progression and changes in OHI-S.

Discussion

The practical value of this protocol lies in standardization. In longitudinal caries research, a small difference in drying time, plaque removal or saliva-collection conditions may create an apparent change that has no biological meaning. Repeating the same sequence at every visit reduces this source of error and makes the child's trajectory easier to interpret.

The protocol also separates cumulative and current disease. DMFT/DMFS records the accumulated burden, whereas ICDAS II describes the present stage of individual lesions. Laser fluorescence adds an adjunctive numerical observation, and saliva testing characterizes the environment in which those lesions are changing. Together, these measures answer different questions; none should be used as a substitute for the others.

Published studies of children with type 1 diabetes report heterogeneous caries experience. A meta-analysis estimated a pooled caries prevalence of 67%, but the variation between studies was substantial [4]. More recent evidence indicates that poor glycaemic control is associated with worse oral health, while well-controlled children may resemble non-diabetic peers in some measures [5]. These findings support individualized monitoring rather than a uniform assumption of high disease activity in every child with diabetes.

A limitation of the study design is the absence of randomization. Differences observed after treatment may partly reflect baseline severity, family adherence or other unmeasured factors. The strength of the design is its relevance to routine practice and its repeated 12-month assessment. Transparent reporting of baseline characteristics and complete follow-up is therefore essential.

Conclusion

A 12-month monitoring strategy provides a clinically coherent way to follow early carious lesions in children with diabetic polyneuropathy. The protocol combines lesion staging, oral-hygiene assessment, adjunctive optical and dye-based methods, and standardized saliva testing at predefined visits. Its central rule is to interpret change as a trajectory supported by concordant findings, not as a single isolated value. This approach can identify early loss of control, guide timely intensification of preventive care and provide a defensible basis for later comparison of conventional and multidisciplinary pathways.

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