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Effects of the Corona Pandemic on Group Prophylactic Measures in Kindergartens: Challenges and Perspectives for Public Health Management

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Summary

The coronavirus pandemic has led to considerable challenges in the education and healthcare system. This study analysed the impact of the pandemic on the implementation of group prophylactic measures in German kindergartens. The aim was to quantify the changes caused by the pandemic and identify possible influencing factors. The data was collected through a nationwide survey of 126 kindergartens, which recorded the implementation of defined measures before, during and after the pandemic. The analysis was based on descriptive statistics and the McNemar test to analyse temporal changes as well as correlations to identify structural influencing factors such as staffing ratios. The results show significant losses in the implementation of group prophylactic measures during the pandemic, which to a large extent have not yet returned to pre-pandemic levels. The staffing ratio of the facilities often played a decisive role in internal measures (e.g. joint tooth brushing), while external measures (e.g. visits to the dentist) recovered significantly better, although these even came to a complete standstill. The results highlight the urgency of making prevention programmes more resilient to crisis situations. Investment in human resources, the development of alternative concepts and the introduction of uniform standards could help to strengthen preventive measures in the long term and promote children's dental health in the long term.

Keywords Corona Pandemic. Group Prophylaxis. Dental Health. Public Health Management. Preventive Measures. Children

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INTRODUCTION

Dental health in childhood has a significant impact on general health and quality of life (Foláyan et al., 2023; Çolak et al., 2013). Caries, the most common chronic disease in children worldwide, can lead to considerable health and social impairments even at an early age (Schmoelke et al., 2021). In Germany, group prophylaxis in kindergartens has established itself as a central component of preventive dentistry. It aims to sustainably improve children's oral health and reduce health inequalities through regular measures such as joint tooth brushing, visits to the dentist and nutritional education (DAJ, 2021; Collet et al., 2020).

The coronavirus pandemic has significantly impaired these established structures. National and international studies show that the restrictions during the pandemic have led to a deterioration in children's health, development and well-being (Kaman et al., 2023; Bantel et al., 2021; Langmeyer et al., 2020). To combat the pandemic, early childhood education and care centres were closed in most countries around the world, including

Germany, from mid-March 2020 (Blum & Dobrotic, 2021), which presumably also has an impact on dental health, as group prophylaxis has a long tradition in these facilities. From the perspective of dentistry, cooperation with parents and kindergartens is crucial for continuous and successful caries prophylaxis (DJA, 2021).

Despite the resumption of many measures after the pandemic, it is reasonable to assume that the return to pre-pandemic standards in group prophylaxis has not yet been fully achieved.

This study aims to provide information and a solid data basis on how the pandemic-related restrictions have influenced the implementation of group prophylactic measures in kindergartens and which measures have now been re-established or continue to show deficits. The aim is to better understand the impact of the pandemic on children's dental health and to identify the structural factors that favour or inhibit the resumption of preventive measures. The findings should help to formulate recommendations for more resilient public health management that stabilises and sustainably strengthens preventive structures even in times of crisis.

METHODOLOGY

Sample

The data basis for this study is formed by responses from **126 kindergartens** that took part in a nationwide online survey. The centres were contacted at random via platforms and networks to ensure that the sample was as representative as possible. The kindergartens surveyed come from different regions of Germany. The aim was to identify regional and structural differences in the implementation of group prophylactic measures.

Survey instruments

A **standardised questionnaire** was developed to collect the data, which specifically targeted the implementation of group prophylactic measures in three time periods: before the pandemic, during the pandemic and today. The questionnaire comprised four key measures, with the former directly targeting dental health and the latter mostly covering this topic peripherally (e.g. low-sugar diet):

1. **Brushing your teeth together**
2. **Visit by a dentist to the centre**
3. **Oral health projects with children**
4. **Information events for parents**

The answers were dichotomous ("yes"/"no", in relation to regular implementation), which made it possible to clearly quantify the changes in the implementation of the measures between the periods. In addition, basic characteristics of the facilities (e.g. number of children in care, staffing ratio or location) were recorded in order to analyse possible influencing factors. For this purpose, the kindergartens were assigned to different comparison groups according to the respective criterion.

Statistical analysis

The statistical analysis aimed to identify changes in the implementation of the four group prophylactic measures over time and to investigate possible correlations with structural factors. The following tests were used for the analysis:

- **McNemar test**: This test was used to analyse significant changes in the implementation of the measures between the time periods ("before vs. during", "during vs. after", "before vs. after"). As a test for paired dichotomous data, it was ideally suited for analysing longitudinal changes.
- **Correlation analysis**: Pearson correlation coefficients were calculated to analyse the relationship between the implementation of measures and structural factors (e.g. staffing ratios, location). These provided information on whether and to what extent certain factors favour the resumption of preventive measures.

The data analysis was carried out using standard statistical software programmes. Significance was tested at a level of $\mathbf{p < 0.05}$.

RESULTS

The nationwide survey of 126 kindergartens provided insights into the implementation of group prophylactic measures before, during and after the coronavirus pandemic. The regular implementation of four measures was analysed: joint tooth brushing, visits to the dentist, oral health projects and information events for parents. The analysis focussed on changes over time and the correlations with criteria such as geographical location and staffing ratios.

Brushing your teeth together

Before the pandemic, joint tooth brushing was established in all 126 facilities surveyed (100%). During the pandemic, implementation fell to 11.11%, which can be attributed to the hygiene and infection prevention measures. After the pandemic, the measure was reintroduced in 51.59% of nurseries. The McNemar test revealed highly significant differences between the periods "before the pandemic" and "during the pandemic" ($p < 0.001$) and between "during the pandemic" and "after the pandemic" ($p < 0.001$). This confirms that the pandemic has caused a significant reduction in this measure and that a partial but incomplete recovery has taken place after the pandemic.

The analysis showed that an optimal or more than optimal staffing ratio significantly increased the probability of readmission ($r = 0.56$). An "optimal staffing ratio" was defined in this study as the presence of at least two trained nursery nurses per 25 children. Centres that met or exceeded this staffing ratio were able to reintroduce the measure significantly more often than centres with a lower staffing ratio. This illustrates that sufficiently qualified staff is a key prerequisite for the successful implementation of time-intensive preventative measures such as joint tooth brushing.

Visits from the dentist

Before the pandemic, 96.03% of nurseries had regular visits to the dentist. During the pandemic, there was a complete collapse in this measure (0%), which can be attributed to the strict hygiene and infection control measures and the general restrictions on access to external visitors. After the pandemic, 92.86% of facilities resumed this measure, although the original frequency before the pandemic was not fully reached. The McNemar test showed significant differences between the periods "before the pandemic" and "during the pandemic" ($p < 0.001$) and between "during the pandemic" and "after the pandemic" ($p = 0.0027$). This shows that the pandemic led to a complete collapse in this measure, but that the situation improved significantly after the pandemic.

A differentiated analysis shows that the pandemic-related restrictions had a massive impact on the number of visits to the dentist in all geographical categories. However, kindergartens in large cities showed the highest probability of consistently implementing this measure again. However, this observation was not significant ($r = -0.07$), although a minimal bias was found in favour of urban facilities. These differences could indicate logistical and infrastructural challenges in less densely populated areas, which could make the organisation of such visits more difficult.

Oral health projects

Regular oral health projects were carried out in 94.44% of nurseries before the pandemic. During the pandemic, this proportion fell to 33.33% and rose to 65.87% after the pandemic. The McNemar test confirmed significant differences between the periods "before the pandemic" and "during the pandemic" ($p < 0.001$) and between "during the pandemic" and "after the pandemic" ($p < 0.001$). The comparison "before the pandemic" and "after the pandemic" also continued to show significant differences ($p < 0.001$), which indicates that the projects could not be fully restored to their previous level after the pandemic.

A weak positive correlation with the staffing ratio ($r = 0.3$) indicates that facilities with better staffing levels resumed projects more frequently. This shows that an optimal or more than optimal staffing ratio had a positive influence on the implementation of projects to promote oral health both during and after the pandemic. By contrast, kindergartens with less than optimal staffing ratios had significantly greater difficulties in continuing these educational measures. This shows that staff resources are not only crucial for general care, but also for specific preventative measures.

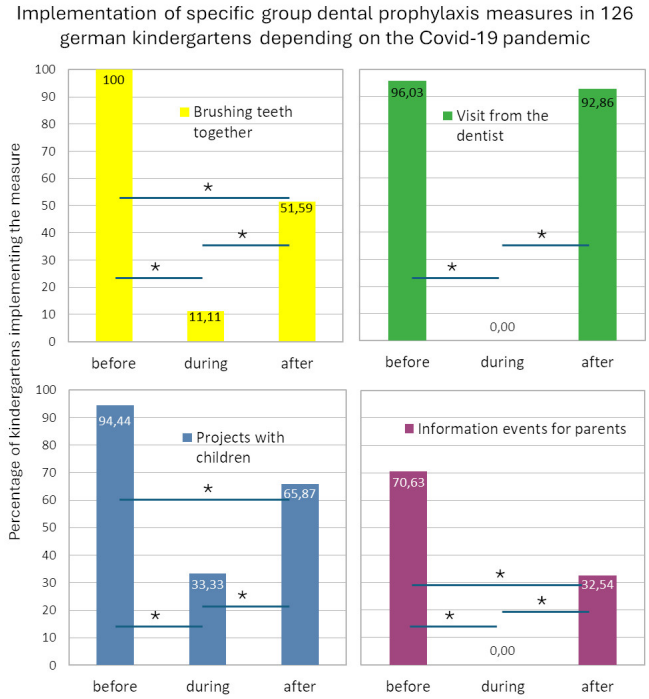
Information events for parents

Before the pandemic, 70.63% of the nurseries surveyed organised regular information events for parents in which important aspects of oral health and oral hygiene were discussed. During the pandemic, these events came to a complete standstill (0%). After the pandemic, the proportion of centres that held such events again rose to just 32.54%. The McNemar test showed significant differences between "before the pandemic" and "during the pandemic" ($p < 0.001$) as well as between "during the pandemic" and "after the pandemic" ($p < 0.001$). The comparison "before the pandemic" and "after the pandemic" also continued

to show significant differences ($p < 0.001$), which indicates a continued reduction in the implementation of these measures.

The data analysis showed that although the staffing ratio played a tendetial role, it did not have a clear influence ($r = 0.21$). This suggests that other organisational or structural factors may have played a greater role, such as the prioritisation of other tasks or the limited availability of resources for such events. However, as expected, institutions with less than optimal staffing ratios had the greatest difficulty in resuming these measures, which could be due to the additional strain caused by the pandemic.

Figure 1 Graphical representations of all changes in the implementation of specific group dental prophylaxis measures in German kindergartens as a temporal response of the Covid-19 pandemic (n=126; statistical differences are marked with an asterisk; McNemar test)



DISCUSSION

This study examines the effects of the coronavirus pandemic on the implementation of group prophylactic measures in German nurseries and highlights key challenges and potential areas of action for public health management. A clearly summarised graphical representation of the results can be found in Figure 1. Furthermore, Table 1 shows the main observations and the most important influencing factors identified.

Table 1 Overview of influencing factors and remarks on the implementation of oral health measures in childcare facilities during and after the COVID-19 pandemic.

Measure	Influencing Factor	Remarks
Brushing Teeth together	**Staffing ratio (strong positive correlation, r = 0.56)**	**Resumption is highly dependent on staffing levels; better staffing increases the likelihood of implementation.**
Oral health projects with kids	Staffing ratio (weak positive correlation, r = 0.30)	Facilities with better staffing levels resumed projects more frequently; positive influence of staffing on implementation.
Visits from the dentist	-	Almost full resumption; logistical differences in rural areas; geographic location plays a minimal role.
Information events for parents	Staffing ratio (no clear influence, r = 0.21)	Organizational factors play a greater role; staffing has little influence on implementation.

Decline in group prophylactic measures due to the pandemic

The results show a significant slump in the implementation of group prophylactic measures during the pandemic in the kindergartens surveyed. This applies in particular to joint tooth brushing and oral health projects, which came to an almost complete standstill. One of the main reasons for this were pandemic-related restrictions such as reduced group sizes, the ban on mixing groups and the minimised use of shared spaces such as washrooms, which created organisational challenges that made it difficult to implement these measures (DAJ, 2021).

In addition, external parties were banned from entering nurseries as an infection control measure, which directly prevented dentist visits and information events for parents from taking place (Blum & Dobrotic, 2021). This ban interrupted direct contact between dentists and children and also made cooperation with educational staff and parents, which is essential for effective prophylaxis, more difficult.

Slow recovery after the pandemic

Most measures were resumed after the pandemic, but many did not reach the original pre-pandemic level. This is particularly noticeable in the case of joint tooth brushing (51.59% after the pandemic vs. 100% before the pandemic) and information events for parents (32.54% after the pandemic vs. 70.63% before the pandemic). This indicates that organisational and personnel challenges still exist. An optimal or above-average staffing ratio proved to be a decisive factor for the resumption of these measures ($r = 0.56$ for joint tooth brushing, $r = 0.30$ for oral health projects). The analysis confirms earlier findings that a shortage of specialist staff in nurseries not only significantly impairs the quality of care, but also the implementation of preventive health programmes (Weimann-Sandig & Kalicki, 2024; DAJ, 2021). In particular, facilities with a "less than optimal" staffing ratio had greater difficulties in resuming preventive measures.

Effects of the entry ban

The lockdown imposed during the pandemic had far-reaching consequences for the implementation of dental visits and other external programmes. Preventive dental check-ups, which took place in 96.03% of nurseries before the pandemic, were completely suspended during the pandemic. After the restrictions were lifted, these programmes were re-established in 92.86% of facilities, which underlines the resilience of professional prevention structures. Nevertheless, rural areas remain slightly disadvantaged, which could indicate logistical challenges (Schmoelke et al., 2021; Blum & Dobrotic, 2021).

CONCLUSIONS AND IMPLICATIONS FOR PUBLIC HEALTH MANAGEMENT

The results of the study emphasise the considerable challenges that the coronavirus pandemic has brought for dental health and prevention structures in nurseries. This results in important recommendations for action for public health management:

1. **Strengthening external support**: External stakeholders such as dentists or dental professionals should be more frequently and intensively involved in preventive structures in order to compensate for internal deficits caused by the shortage of specialists (DAJ, 2021).
2. **Integration of preventive measures into standards**: Anchoring preventive health measures in the standard guidelines of kindergartens would ensure that such measures can also be implemented in times of crisis (Jesberger & Greß, 2021).
3. **Digitalisation of prevention programmes**: The development of digital formats, such as parent webinars or interactive learning platforms for children, could be an important addition to traditional measures and overcome language and access barriers (Bird et al., 2019; El Benny et al., 2021).
4. **Long-term strategy against shortage of skilled staff**: The shortage of skilled staff in nursery schools remains a structural problem. Measures to reduce the workload of teaching staff and targeted investment in the training and recruitment of specialist staff are essential to ensure the implementation of internal prevention measures (Weimann-Sandig & Kalicki, 2024).

The pandemic has shown that preventive health measures for children need to be made more

resilient in order to survive in times of crisis. Public health management can make a significant contribution here by developing both structural and organisational solutions that ensure children's dental health in the long term.

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