PARENTAL PERCEPTION TOWARDS UTILISATION OF GENERAL ANAESTHESIA FOR DENTAL TREATMENT AMONG CHILDREN

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LIST OF ABBREVIATIONS

AMDI	Advanced Medical and Dental Institute
USM	Universiti Sains Malaysia
GA	General anaesthesia
LA	Local anaesthesia
mPPQ	Modified parental perception questionnaire
ECC	Early childhood caries
NCDs	Non-communicable diseases
NPO	Nil Per Os (Nothing by mouth)
SD	Standard deviation
ASD	Autistic spectrum disorder
DGA	Direct group activities (needed for children with autism)
QOLS	Quality of Life Scale
SSCs	Stainless steel crowns
AHA	American Heart Association
P-CPQ	Parental–Caregivers Perceptions Questionnaire
ICC	Intraclass correlation coefficient
FVI	Face validity index
S-FVI/Ave	Scale-level face validity index average method
S-FVI/UA	Scale-level face validity index universal agreement method
IQR	Interquartile range
SPSS	Statistical Package for the Social Sciences
IBM	International Business Machines

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PERSEPSI IBUBAPA TERHADAP PENGGUNAAN BIUS AM UNTUK RAWATAN PERGIGIAN DALAM KALANGAN KANAK-KANAK

ABSTRAK

Meneroka penerimaan ibu bapa terhadap penggunaan anestesia am (GA) untuk rawatan pergigian anak-anak mereka adalah penting. Kajian ini fokus untuk menentukan hubungkait di antara jenis rawatan pergigian dan penerimaan ibu bapa terhadap GA, dan meneroka rawatan pergigian yang biasa dilakukan untuk pesakit pergigian pediatrik di AMDI, USM di Malaysia. Satu rationale bagi kajian ini adalah untuk memenuhi kekangan sorotan literitur terhadap faktor-faktor yang mempengaruhi aplikasi GA dalam penjagaan pergigian pediatrik. Fasa retrospektif melibatkan analisi rekod pergigian kanak-kanak dari 1st Januari 2015 sehingga 31st Disember 2022 yang berada dalam databes AMDI. Fasa prospektif melibatkan penerokaan persepsi ibubapa terhadap penggunaan bius am bagi rawatan pergigian anak-anak mereka menggunakan soal-selidik kendiri. Sample kajian melibatkan 822 ibubapa yang merupakan subjek kajian dalam memberikan data bagi 411 kanak-kanak. Kajian menunjukkan bahawa rawatan yang biasa diberikan kepada kanak-kanak adalah cabutan gigi (68.46%) dan tampalan sewarna gigi (61.02%). Berdasarkan soal-selidik, sebilangan kecil ibubapa (34.55%) menerima penggunaan bius am bagi rawatan pergigian anak-anak mereka. Terdapat hubungkait yang signifikan dan positif dengan cabutan gigi ($r = 0.376$; $p < 0.05$) dan tampalan gigi ($r = 0.257$; $p < 0.05$). Bius am telah digunakan dalam kadar yang lebih tinggi dalam kalangan kumpulan umur 7 hingga 12 tahun berbanding kumpulan umur 0 hingga 6 tahun atau 13 hingga 17 tahun ($p < 0.05$). Strategi penjagaan pergigian signifikan untuk kanak-kanak melibatkan memberus gigi, mengawal pengambilan gula, dan memberikan nasihat penjagaan pergigian ($p < 0.05$).

Kesimpulannya, prosedur yang invasif dan boleh menyebabkan tahap kesakitan yang tinggi kepada anak-anak mereka berkait dengan penerimaan ibubapa terhadap penggunaan GA untuk rawatan pergigian.

PARENTAL PERCEPTION TOWARDS UTILISATION OF GENERAL ANAESTHESIA FOR DENTAL TREATMENT AMONG CHILDREN

ABSTRACT

Exploring parental acceptance of the use of general anaesthesia (GA) for their children's dental treatment is crucial. This study aimed to determine the association between type of dental treatment and parental acceptance for GA, and explore common dental treatments performed for paediatric dental patients at AMDI, USM. One rationale for this study was to fill the literature gap of factors that influence GA application in paediatric dental care. The retrospective phase involved analysing children's dental records from 1st January 2015 to 31st December 2022 found in the AMDI database. The prospective phase involved assessing parental perceptions of GA for their children's dental treatment using a self-administered questionnaire. The research sample involved 822 parents providing data for 411 children, who were subject of study. The results revealed that the most common treatments given to children were tooth extraction (68.46%) and tooth coloured restoration (61.02%). According to the findings, not many parents (34.55%) accepted the use of GA for their children's dental treatment. There was a significant and positive relationship between parental acceptance of GA in children's dental treatment and tooth extraction ($r = 0.376$; $p < 0.05$) as well as tooth filling ($r = 0.253$; $p < 0.05$). GA was applied at significantly higher rates among children aged 7 to 12 years old compared to the 0 to 6 year old or 13 to 17 year old age groups ($p < 0.05$). Significant dental care strategies for children involved tooth brushing, controlling sugar intake, and providing dental care advice ($p < 0.05$). In conclusion, invasive procedures that cause high levels of pain for their childen are associated with parental acceptance of the use of GA for dental treatment.

CHAPTER 1

INTRODUCTION

1.1 Background of the study

Dental caries and related oral health challenges have been continuously changing and rising on a global scale. The World Health Organisation (2023) reports that oral disorders affect over 3.5 billion individuals worldwide. Furthermore, three-quarters of those affected live in middle-income countries. Global projections indicate that dental caries affects approximately 2 billion individuals in their permanent dentition, and approximately 514 million children in their primary dentition. The World Health Organisation (2023) highlighted that the worldwide prevalence of primary oral illnesses has been on the rise due to increasing urbanisation along with shifts in the style of living. Primary contributing factors include insufficient consumption of fluoride in water sources and dental hygiene goods such as toothpaste, lower prices, and accessibility of food items with high sugar levels. Additionally, limited opportunities for dental health treatment facilities within the local population further exacerbate the issue. The marketing and promotion of high-sugar foods and beverages, as well as tobacco and alcoholic drinks, have led to a rise in consumption. This, in turn, contributes to the development of oral hygiene disorders and other non-communicable diseases (NCDs) (World Health Organisation, 2023). Furthermore, studies have shown 85% of young children suffer from caries (Anil & Anand, 2017). A recent investigation in Brazil revealed a notable prevalence rate of approximately 3.5% for gingival abscess in pre-school children, specifically those aged 4 to 6 years old (Bittencourt et al., 2021). These findings revealed that dental problems remain a problem for the young population, with rising cases of dental caries that require swift and focused treatment.

There are two types of dental caries: primary and secondary. Primary caries is defined as the development of a lesion on the surface of the tooth (Machiulskiene et al., 2020). Additionally, Machiulskiene et al. (2020) stated that secondary caries refers to the formation of a lesion that is adjacent to an existing caries. Early childhood caries (ECC), also known as dental decay amongst young individuals, can have detrimental effects on one or several teeth, particularly in children under the age of six (Machiulskiene et al., 2020). Oral and dental related problems are commonly characterised by a malodorous scent emanating from the mouth. All age cohorts observe the prevalence of cavity development and associated dental issues, with adolescents showing a higher susceptibility. Oral issues are prevalent among young people in several nations, with India and Japan experiencing an increase of over 40% across all age groups (Almadhi et al., 2021). These highlights show that dental caries have a contagion effect on children's health and that they require solutions at an early stage to prevent long-term conditions that may suppress patients' wellbeing.

There are various ways to implement dental treatment. According to Swarn & Swift (2012), the management of dental plaque and cavities necessitates the use of both pharmacological and mechanical treatment approaches. Furthermore, this approach may lead to the use of intrusive techniques as a final resort in the treatment process (Swarn & Swift, 2012).

Effective interaction and the development of tools for behavioural counselling are considered the most efficacious approaches to dental therapy for children. According to the American Academy of Paediatrics (2021), there are two primary approaches for providing behavioural recommendations: pharmaceutical and non-pharmacological methods. Nonetheless, a significant obstacle to the investigation and execution of necessary medical interventions

in paediatric patients lies in their limited compliance with dental procedures. Consequently, it is crucial to carefully contemplate the use of general anaesthesia (GA) as a viable alternative (Zou et al., 2018). Therefore, it is evident that different scholars consider behavioural counselling to be one of the most efficient ways to administer dental therapy to young people.

The intervening effects of parental perceptions on children's dental treatment using GA have been a topic of debate among scholars. Pakkhesal et al. (2021) assert that the system did not promote parental involvement. A study investigates the features and dental procedures administered to children under GA performed in a tertiery referral centre in the northern region of Malaysia. Their retrospective examination's primary goal was to explore the range of dental therapy choices available, and the background review underscores the need for further exploration to fully understand the dental procedures applied to children under GA (Nadeem et al., 2020).

1.2 Problem Statement

The study on GA and paediatric dental treatment still reveals gaps that require further elaboration. Stensson et al. (2021) documented numerous instances of parental endorsement of the use of anaesthesia in general. However, prior studies have met several limitations, including limited sample sizes and a lack of representation of children under the age of nine (Alwadi et al., 2022). Additionally, there have been proven challenges in obtaining parental participation in survey-based studies (Pakkhesal et al., 2021). As noted by Strom et al. (2015) when treating children, a dental professional faces a barrier to providing a pain-free therapeutic procedure because of their young age or behavioural or medical conditions.

Although GA administration can help with pain management, Ramdaw et al. (2017) noted that parents frequently oppose this course of therapy, if not entirely dismiss it, for a variety of reasons, including an absence of knowledge, procedure-related anxiety and fear, as well as financial constraints or waiting times. According to Karim et al. (2008), there is limited information available in Malaysia regarding factors that influence GA use in paediatric dentistry. Furthermore, surveys conducted in Malaysia reveal a 61.6% rate of dental caries among children, yet the literature lacks information on potential interventions to tackle this issue (Nordin et al., 2019). Furthermore, not many studies evaluated parents' opinions of dental therapy under GA, along with how it impacts their child's well-being and quality of life. The present study will address these gaps by focusing not only on the use of GA in dental treatment, but also on strategies to enhance children's oral health, taking into account the frequency of dental treatments provided.

State-of-the-art or contemporary hospital settings with modern treatment techniques and technologies often offer the option of GA available for paediatric patients, tailoring care to their physiological, emotional, and rehabilitative requirements. However, the care facilities' constrained accessibility limits them to a few major medical centres with GA facilities and paediatric dental specialties as seen in the Malaysian scenario (Karim et al., 2008). According to Roberts et al. (2020), therapy using GA is a costly technique, and a majority of parents simply say "no" because of financial difficulties or because they are very afraid of the serious consequences associated with GA. Parents can also find treatment under GA convenient, given its high effectiveness and minimal negative consequences (Du et al., 2022). Surgical procedures use GA to enhance the effectiveness of the surgical process by influencing sensory variables. In this case, GA helps to numb pain and relieve patients’ anxiety

during surgery. Nevertheless, it is important to acknowledge that GA can have significant drawbacks. For instance, a study by Blumer et al. (2017) found a reported recurrence rate of caries of up to 57% associated with the use of GA. The findings of this research will assist in recording the type of care provided and the rationale behind the children receiving GA therapy for dental treatment.

1.3 Conceptual Framework

The model framework indicates that before choosing a treatment, including the number of teeth to be treated, the children's patients' exhibit demographic aspects such as age and gender, as well as behavioural orientations such as fear, anxiety, and attitude towards the upcoming treatment for their dental problems. As a result, both demographics and behavioural orientations influence the decision to treat their tooth problems. Given the treatment decisions, the parents either accept or deny the proposed therapeutic solutions or course of action, and this has moderating effects on the application of GA to their children. Parental perceptions or acceptance, in turn, influence the effectiveness of the GA in positively impacting the children's health, wellbeing, or quality of life after the procedure. Figure 1.1 displays the conceptual framework of the study.

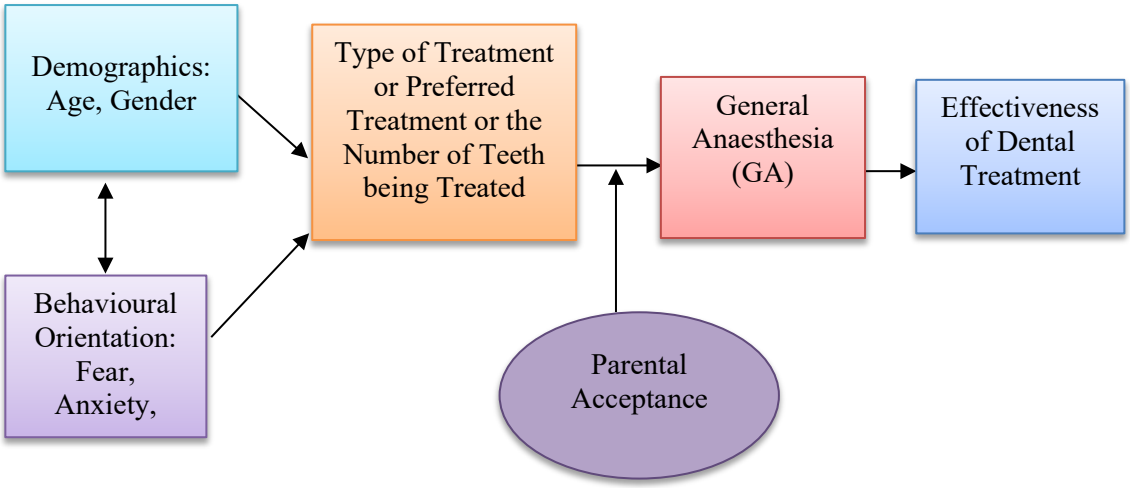

Figure 1.1 Conceptual Framework

1.4 Objective of the study

1.4.1 General Objective

To determine the parental perception towards the utilisation of general anaesthesia at Advanced Medical and Dental Institute (AMDI), Universiti Sains Malaysia, and Pulau Pinang.

1.4.2 Specific Objectives

1. To determine the type of treatment being performed for paediatric dental patients at AMDI, USM.
2. To assess parental acceptance of dental treatment under dental GA using a modified parental perception questionnaire (mPPQ) among parents attending the dental clinic at AMDI.
3. To determine the association between type of dental treatment and parental acceptance for GA.

1.5 Research Questions

1. What type of treatment for paediatric dental patients was performed at AMDI, USM, Pulau Pinang?
2. How does the type of dental treatment performed under GA influence parental perception of GA usage?
3. How does the type of dental treatment influence its association with parental acceptance of GA?

1.6 Hypothesis of the Study

Hypothesis 1: Relationship between parental acceptance of dental treatment administered through GA and type of treatment being performed for paediatric dental patients.

Null hypothesis: No significant relationship exists between parental acceptance of dental treatment administered through GA and the type of treatment being performed for paediatric dental patients.

Alternative Hypothesis: A significant relationship exists between parental acceptance of dental treatment administered through GA and the type of treatment being performed for paediatric dental patients.

Hypothesis 2: Relationship between types of dental treatment and parental satisfaction with GA in dental treatment

Null hypothesis: No positive and significant relationship exists between types of dental treatment and parental satisfaction with GA in dental treatment.

Alternative Hypothesis: A positive and significant relationship is present between types of dental treatment and parental satisfaction with GA in dental treatment.

1.7 Research Approaches

The study used a prospective and retrospective cross-sectional design, involving parents who directly participated in their children's dental treatment using GA. The retrospective phase involved extracting patient records from the AMDI database, which included children enrolled in the dental clinic and receiving their dental treatment. On the other hand, the prospective phase involved enrolling parents/guardians through the

coordination of a self-administered questionnaire, while adhering to all ethical standards and responsibilities.

1.8 Significance of the Study

Addressing the research will also yield several valuable contributions. The study offers significant health insights that the dental care industry can utilize to provide children with high quality care. Moreover, the study presents parents' perceptions of critical procedures like GA, which require effective execution to promote sustainable dental treatment.

1.9 Thesis Outline

This thesis is structured into six chapters as follows: Chapter one outlines the study's background, research problem, investigation questions, objectives and significance. Chapter two features the presentation of a relevant theoretical framework and an assessment of empirical literature on the subject matter, as well as review of the gaps in knowledge. Chapter three addresses the methodological process in terms of research design, research approach, research methods, sampling, and instrumentation, collection of data, analysis of data, ethical considerations, and methodological limitations. Chapter four presents the research findings drawn from the questionnaire analysis as well as the underlying meaning in context of the study's goals and objectives. Chapter five underscores the discussion of the findings and the extended implications while chapter six captures the re-evaluation of key findings, key recommendations, areas of future research, and limitations.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The current chapter reviews the literature on how parents perceive the use of general anaesthesia (GA) for paediatric dental treatment. The issues addressed include an explorative understanding of GA, types and stages of anaesthesia, and the use of GA as a method for providing dental treatment in children.

2.2 Perceptions towards dental treatment

The current review aims to explain GA and its use in dental treatment in a broader context. Perception refers to beliefs, attitudes, and expectations regarding a particular issue (Alfarraj et al. 2023). In the context of this study, parental perception entails the attitudes and beliefs of parents regarding the use of GA in their children's dental treatment. In their 2022 study, Yener et al. say that GA, which includes both inhalatory and total intravenous anaesthesia (TIVA), is a way to make patients completely unconscious during surgery. Therefore, a primary advantage of GA is its ability to produce a deep state of unconsciousness that allows surgeons to conduct invasive medical procedures (Yener et al., 2022). However, despite its widespread usage, GA may have some potential limitations. As Yener et al. (2022) noted, these operations may entail a much longer recovery period and, in some cases, an increased probability of complications when compared to the use of sedative anaesthesia. Therefore, it is crucial to highlight that the aforementioned risks can demonstrate significant differences depending on specific patient features and the surgical situation. According to Chen et al. (2014), the use of comfort medication has gained significant

traction, leading to a growing number of individuals opting for GA for various medical procedures. In recent years, there has been a shift in the administration of anaesthesia for different medical procedures. Particularly, the use of GA has replaced the use of local anaesthesia (LA) for several procedures. The change's goal is to improve the whole medical procedure for patients. As a result, non-intubated GA has notably increased outside of the conventional surgical environment. Chen et al. (2014) asserted that acknowledging and addressing the potential risks associated with non-intubated GA administered outside of traditional operating rooms is imperative. A variety of factors influence these risks, including the limitations of the setting, the conditions surrounding the equipment, and the specific anaesthesia protocols used. In addition, Chen et al. (2014) stated that the delivery of GA without intubation in a non-operating room environment requires early anaesthesia induction, a smooth anaesthetic experience, rapid recovery, and few postoperative complications. It is necessary to adopt an anaesthetic pharmaceutical regimen that is both highly dependable and effective. Overall, the findings show applying GA to dental patients has both risks and benefits, which sound practice should balance.

2.3 General anaesthesia in paediatric dental treatment

Several studies have explored the scope of GA and its adoption when administering dental treatments to paediatric patients. Thus, an understanding of GA in dental treatment is a starting point for fully comprehending its implications for paediatric patients. Brailo et al. (2019) stated that individuals whose conduct is difficult to regulate through nonpharmacological methods such as "tell-show-do," positive reinforcement, voice control, and aversion, or pharmaceutical strategies like the use of sedation via nitrous oxide and oral sedation, can only benefit from the use of GA in

dental procedures. Chen et al. (2022) asserted that GA usage holds particular significance for individuals with mild to profound cognitive impairments, in accordance with Brailo et al. (2019). This is because a cohort typically exhibits suboptimal oral hygiene and heightened dental needs compared to the overall healthy population. Consequently, GA frequently represents the sole viable method for administering dental care rehabilitation to this specific population. In a similar vein, Chen et al. (2014) asserted that individuals with intricate health issues, young children necessitating invasive dental treatments, or patients who have sophisticated complete mouth caries requiring thorough oral health care are additionally appropriate prospects for GA. Furthermore, individuals who are otherwise healthy but suffer from severe dental anxiety or show significant noncompliance may also be eligible for GA. The aforementioned statements clearly illustrate that GA becomes a viable option when patients' behavioural orientation prevents them from seeking a standard procedure. Thus, as a last resort GA seems to be considered in cases where the subjects have proven to not have the capacity to undergo normal oral sedation for example.

The subjects perceive general anaesthesia to have positive effects. According to Brailo et al. (2021), administering dental care under GA offers a range of benefits. Among these benefits is the elimination of the need for patient collaboration, as GA renders patients unconscious and unresponsive to pain. Following the surgery, patients exhibit a certain level of forgetfulness, necessitating adjustments in medicine administration to ensure an appropriate dosage. Furthermore, Brailo et al. (2019) held that providing dental care using GA necessitates the application of specially designed equipment, resources, and a proficient team of specialists. This is particularly crucial for effectively addressing any difficulties that may arise during both the intraoperative and postoperative phases. The American Academy of Paediatric (2021) reported a

notable increase in the occurrence of severe postoperative complications when conducting these operations in office environments, as opposed to medical centres with proper facilities, based on the findings of Brailo et al. (2019). Overall, the aforementioned assertions highlight various scholarly perspectives on the benefits and limitations of GA in dental treatment. Therefore, it illustrates the potential impact on parents' perceptions, particularly the concerns associated with the use of GA, should their child require a similar procedure.

Several studies have justified the administration of GA to paediatric patients. GA has received extensive reporting as a practical treatment approach for providing dental care, particularly in cases involving resistant paediatric patients (Turjanski et al., 2023). According to López-Velasco et al. (2021), treating dental problems in 45 groups of children aged 4 to 12 with special medical needs often necessitates a different approach. These modifications aim to accommodate individuals with disabilities based on their unique neurological, emotional, physical, sensory-related, intellectual, behavioural, or developmental aspects. According to Brailo et al. (2019) and Brailo et al. (2021), there is a consensus that GA is a widely validated treatment approach for delivering intricate dental procedures across all age groups. Butler et al. (2021) affirmed that one key benefit of using GA in the special healthcare needs population is the potential to deliver entire treatment in just one appointment, thereby minimising the need for many sessions and mitigating the occurrence of anxious situations associated with visits. Rathi et al. (2021) and Campbell et al. (2018) echoed these thoughts, emphasising that research using parent-based surveys reveals positive attitudes among parents toward pharmacological interventions for behavioural control, particularly when sedation or GA is involved. We attribute this phenomenon to an enhanced

understanding of the hazards associated with GA and an increased awareness of the beneficial effects associated with dental procedures.

Aldossari et al. (2019) emphasised, in line with the aforementioned assertions, that GA should only be considered a last resort in dental treatment, given the potential negative consequences, including distress and fear. Furthermore, when it comes to the provision of healthcare, clinical procedures performed in GA settings tend to be more aggressive. For instance, patients often prefer the extraction of a tooth or teeth over a less-invasive option like endodontic treatment. In concurrence, Vertullo et al. (2021) stated that, despite advancements in preventative and restorative dental care, there is a growing trend of teeth extraction among paediatric patients with exceptional healthcare requirements. This trend is particularly prominent among children who have intellectual impairments. In conclusion, the reviewed studies suggest that GA adoption is a last resort, as other conventional procedures may not provide effective dental treatment for paediatric patients. The studies have highlighted the possibility of patients with special needs or intellectual disabilities not cooperating during the procedures. Therefore, when discussing parental perceptions of GA, it would be beneficial to evaluate any differences between the sample of paediatric patients with special needs and subjects under normal circumstances.

2.4 Types and outcomes of GA on paediatric dental patients

Different conditions have been considered for paediatric dental health rehabilitation procedures, depending on the subjects and the availability of resources. Azimi et al. (2022) recorded disparities with repeated weekly observations in the oral interventions administered to 15 children in the age range of 3 to12 years diagnosed with autistic spectrum disorder (ASD) who underwent GA. However, the authors did

not explicitly define if the control sample consisted of healthy children, individuals that had additional distinctive medical demands, or a combination of both. In contrast, Arnold et al. (2015) reported using a sample size of 35 children aged 4 to 10 years diagnosed with ASD that underwent a much lower number of pulpotomies plus crowns during GA compared to their healthy counterparts. It is important to do a full analysis of the oral interventions given to children with ASD under GA compared to their healthy peers. This can reveal differences in the dental needs, treatment methods, and strategic considerations that are unique to children with ASD. Alghafis et al. (2023), conducted an evaluation of dental care attributes in 54 children aged 3 to14 years, diagnosed with special needs and suffering from acute tooth decay (cavities), over a two-week period. The assessment involved a comparison between dental treatments administered using GA versus those performed on a control group of similar age and in healthy condition. The month-time retrospective review by Alghafis et al. (2023) involved gathering information from medical files of children aged 2 to13 years diagnosed with ASD. The data encompassed several aspects, such as socioeconomic status, health-related details, and dental history. The finding by Alghafis et al. (2023) showed that 65% of the children with ASD underwent diagnostic assessment, primarily consisting of a single repeat visit. Moreover, the children exhibited notably more adverse behavior as the severity escalated, leading to an elevated demand for direct group activities (DGA) and an increase in the number of repeat sessions. Thus, the evaluation above presents the typologies and outcomes of group activities (GA) administered to paediatric dental patients with special needs, compared to a healthy cohort. The researcher confirmed that the children's conditions may lead to significant differences in their perceptions of GA. For instance, it would be worthwhile to establish which perceptions have more negative outcomes, such as fear from parents.

Further, in understanding the different treatments applied in dental treatment using GA, thoughts on the complications that accompany the procedure are presented in various studies. Brailo et al. (2021) conducted a survey among caregivers or parents of 66 children, with a median age of 10 years, who received dental treatment using GA within a daycare surgery environment to investigate the incidence and management of post-discharge difficulties. After analysis, the researchers noted that the common postoperative complications that accompany dental treatment in GA among children include drowsiness (60.6%) and pain (60.6%) (Brailo et al., 2021). Additionally, in 91.9% of postoperative complication cases, parents and carers implemented conservative measures at home such as using ice packs and analgesics to manage the complications (Brailo et al., 2021). However, in 8.1% of the postoperative complications, carers or parents engaged in phone consultations with general medical practitioners and dentists to identify the best interventions (Brailo et al., 2021). The last study by Brailo et al. (2021) found a strong link between younger age and drowsiness after GA dental treatment (Odds Ratio = 0.903; $p < 0.05$). This is likely because GA affects brain hormones and neurotransmitters for a long time after surgery is over. While younger age increases the risk of complications for GA in dental treatment, conservative measures at home can manage the health challenges, according to the findings.

Researchers have also explored the issue of dental retreatment to better understand its prevalence and the underlying reasons. In particular, Kaviani et al. (2023) examined the incidence and prevalence of re-treatment among paediatric dental patients aged 4-16 undergoing dental procedures supported by GA. The findings showed that 65% of the 70 paediatric dental patients required dental re-treatment at their next appointment. Kaviani et al. (2023) discovered that while retreatment using GA was

crucial for repeat attendees, prosthesis-related treatments such as paediatric crowns, removable partial dentures, and complete dentures were not as crucial. Furthermore, it was evident that among a cohort of 109 paediatric dental patients, 75% required dental treatment during the third scheduled visit. Significantly, the third paediatric treatment procedure using GA exhibited the highest demand for medical intervention, whereas dental extraction was the least sought-after dental treatment, at a rate of 13%. Therefore, the aforementioned affirmations illustrate instances where dental treatment outcomes, including repeated procedures, have been successful for 66% of paediatric patients. All these factors can be considered major influences on parents' perceptions and decisions regarding the use of GA in children's dental treatment.

Reseachers have assessed the varying types of paediatric dental treatment applied using GA, as well as the emerging outcomes. Dalpian et al. (2018) reported a 5.7% reduction in the effectiveness of treatment in 120 paediatric patients aged 4 to17 years old afflicted with many instances of dental caries. In relation to the claims made above, EzEldeen et al. (2015) said that oral treatment with GA has been less effective (3% of the time) when dental cavities are found at a young age. de Amorim et al. (2018) asserted that a single dental restoration procedure resulted in a survival rate of 94.3% over the first two years, while multiple dental restoration procedures performed in a single session led to a survival rate of 65.4%. Amin et al. (2016), on the other hand, said that previous research had shown that amalgam restorations last longer than compound restorations in children who are under GA for dental procedures (about four years plus veneer restoration).

In line with the above, Nadeem et al. (2020) performed a retrospective study over the types of dental treatments offered to paediatric patients using GA. The study included records of 113 patients under the age of 18 who underwent dental treatment

using GA between November 2015 and February 2019. The data distribution was skewed to the left, with the median age of the paediatric patients being six years old. The review confirmed that early childhood carriers affected the subjects (N = 94) and total oral rehabilitation was administered to a majority of them (N = 82). Furthermore, the study recorded a high number of deciduous tooth extractions (N = 488) compared to permanent teeth (N = 43). Nadeem et al. (2020) reported that the removal of supernumerary and impacted teeth was the leading factor in surgical cases. Restorative procedures use tooth colour restoration, including stainless-steel crowns. However, the majority of the patients underwent GA treatment due to the need for complete oral rehabilitation. Overall, the findings above imply that GA in children's dental treatment is critical where they have early childhood caries or pre-existing medical problems because it aids in better management during comprehensive dental restoration.

2.5 Phases of the implementation of general anaesthesia

To improve its efficacy, dentists can implement GA in various phases during dental treatment for paediatric patients. Lim & Borromeo (2017) classify general anaesthetics into two primary types: inhaled anaesthetics and intravenous anaesthetics. Anaesthesiologists often administer these anaesthetics not only to induce but also to maintain the patient's state of anaesthesia. According to Norderyd et al. (2017), inhaled anaesthetics include gaseous and halogen-containing agents, whereas intravenous anaesthetics are injectable substances that cause anaesthesia.

During the induction period, doctors administer medicines to induce the desired state of unconsciousness, exhibiting symptoms similar to those of amnesia (Norderyd et al., 2017). The excitement phase pertains to the transitional time that occurs subsequent to the administration of anaesthesia and the attainment of an adequate level of

anaesthesia for surgical procedures. Further, Norderyd et al. (2017) stated that during this particular phase, the observer can see variations in the cardiac rhythm, blood pressure, and respiratory patterns.

During the surgical anaesthesia phase as Norderyd et al. (2017) held there is a notable restoration of heart rate, blood pressure, and respiration to their initial levels, which facilitates the individual's progression with the surgical intervention. In line with these assertions, Andreeva (2018) asserts that the overdosing phase pertains to a scenario where an overabundance of prescriptions leads to brain stem lethargy and a potential cardiovascular system breakdown. The aforementioned thoughts can be considered to have significant implications for parental perceptions or acceptance of GA in their children's dental treatment. According to Norderyd et al. (2017), patients may experience distinct panic or anxiety during each phase of the procedure, and parents may oppose the overdose phase due to their concerns about its complications and potential risks for the paediatric dental patient.

The criteria for implementing GA during paediatric dental treatment are assessed in the section. According to Andreeva (2018), the use of GA to manage clinical or behavioural issues, and provide pain-free dental care is contingent upon a set of distinct parameters. These criteria encompass considerations such as hazards, advantages, success, and anticipated outcomes. In tandem with the assertions above, Strom et al. (2015) examined treatment approaches towards paediatric dental treatment namely tell-show-do, desensitising, modelling, hypnosis, sedation, and GA. In agreement, Ali et al. (2016) acknowledged that GA stands as a costly method that presents potential health hazards to paediatric dental patients. However, healthcare practitioners recognise it as a valuable approach for delivering oral healthcare. The procedure is executed with a high rate of success by conducting meticulous

preoperative examinations, employing skilled healthcare professionals, and implementing robust aftercare.

The risk of exposure to dental caries is a major concern across studies for children and GA is considered a suitable treatment approach. Thomson (2016) asserted that various factors, including sugar-rich diets, a high level of bacteria, and poor oral hygiene contribute to dental caries and can affect individuals across different 75% age groups globally. In a comparable manner, Rajavaara et al. (2018) observed that, despite of a 30% decline in the prevalence of dental caries in the past four years, cavities in early childhood continued to be prevalent amongst young children, thereby impacting their general standard of living. However, the Oral Health Programme (2019) expressed a differing opinion, stating that while the prevalence of tooth decay amongst pre-schoolers in Malaysia has indeed dropped, it continues to be a significant issue (Oral Health Programme, 2019).

Additionally, Norderyd et al. (2017) agreed with Rudie et al. (2018), affirming that early childhood caries' requirement for corrective treatment is a significant determinant for dental rehabilitation using GA. The prevalence of children undergoing GA treatment has increased by 33% over the past ten years (Rudie et al., 2018). Aligned with the assertions above, Lim & Borromeo (2017) observed that around 31% of five-year-olds and 46% of eight-year-olds exhibited cavity formation in their primary teeth. The finding has contributed to a 25% rise in the extraction of teeth affected by cavities using GA. Building upon the aforementioned ideas, Hashim et al. (2019) conducted a research investigation in Selangor, Malaysia, encompassing five distinct healthcare facilities. The research investigation concentrated on 158 children, identified as having early childhood caries (ECC), aged 2 to 6 years, with a mean age of 4.5 years. These children received dental care under GA, with the majority of commonly administered

procedures being extractions of 10 teeth at most and subsequent dental restoration at seven teeth the least. In concurrence, Brown et al. (2019) revealed that tooth removal occurs in children aged 2 to11 years at a rate of one within 10 minutes.

GA is the most preferred technique to manage paediatric patients' behaviour during dental treatment, especially those with special needs. Specifically, López-Velasco et al. (2021) investigated the use of GA in dental treatment of paediatric patients and found a prevalence of 87.7% among children with special needs and 69.9% among healthy children. Both Rudie et al. (2018) and Lim & Borromeo (2017) agree that treating paediatric dental patients with complex behavioural needs, isuch as not cooperating, may benefit from treatment with GA using whole oral rehabilitation as an appropriate approach for providing dental care. In another context, Yoon & Kim (2016) argue that alternative approaches that include inhalation, deliberate sedation, and intravenous sedation, are viable options for paediatric dentistry patients. However, it is crucial for practitioners to exercise discretion when employing these approaches, as they require the necessary skills to effectively provide prolonged unconsciousness and mitigate the related dangers.

American Society of Anaesthesiologists (2019) categorises patients based on their physical condition. In agreement, Mayhew et al. (2019) argued that paediatric patients classified as ASA I (representing regular healthy patients) and ASA II (representing patients with moderate complex disease) may receive outpatient treatment with light sedation. GA is typically reserved for instances where comprehensive oral rehabilitation is necessary and the individual exhibits uncooperative behaviour. Affirming the above points, Yoon & Kim (2016) indicated that patients classified as ASA III or higher, indicating the presence of significant systemic illness at 80% among paediatric dental patients that received treatment under GA while being closely

monitored by both an anaesthesiologist and a specialised dentistry staff. While there are no definitive guidelines for GA application, the American Society of Anaesthesiologists (2019) recommends its avoidance or contraindication in cases where an individual has a verified record of allergic responses or arrhythmias.

At present, there is a scarcity of information pertaining to the attributes of paediatric dental care conducted using GA in Malaysia. For example, Hashim et al. (2019) performed a study that relied on accounts of treatments performed at an academic medical centre, and over fifty studies, to evaluate the results of dental treatment for early childhood caries (ECC) under GA. Hashim et al. (2019) built upon their previous research to conduct this investigation. In concurrence, the Oral Health Programme (2019) established that tertiary care facilities located in the main cities of Malaysia typically provide child dentistry reviews and GA treatments. Further, the Oral Health Programme (2019) held that there was a notable rise rated at 40% in the provision of primary dental services to children with special needs. The upward trajectory at 40% has been observed consistently throughout the course of ten years.

2.6 Utilisation of GA for dental treatment in children

2.6.1 Treatment delivered using GA among paediatric dental patients

Singh et al. (2020) study examined how parents and children perceived the impact of childhood dental cariers on health-related quality of life. Consequently, Singh et al. (2020) recruited participants comprising children between the ages of 3 and 5 who were in excellent physical condition, together with their respective parents or guardians. The study participants willingly engaged in individual interviews and effectively completed the Quality of Life Scale (QOLS), encompassing both the child and parent iterations. Their study created a survey to assess the progress of dental treatment

performed under GA for children under 14 years old. They administered the survey to 150 participants, children diagnosed with early childhood caries (ECC) and their parents. The researchers conducted a comprehensive analysis of the data, bolstering their findings by employing statistical analytical methods. Their research revealed that people suffering from early childhood caries (ECC) have a lower quality of life connected to oral hygiene compared to those without dental caries. After the treatment was over, a one-month follow-up revealed a significant improvement in the children with early childhood caries (ECC) oral hygiene quality of life (Singh et al., 2020). This improvement also positively influenced how parents viewed GA. Based on the aforementioned perspectives; Ali et al. (2016) contended that although children are capable of providing self-reports the consent and approval of their carers are still essential in the reporting process. Parents play a vital role as the primary advocates for their children in all healthcare settings. As a result, it is critical to meticulously examine and gain a more profound understanding of their point of view.

In addition, Ali et al. (2016) argued that parents play a crucial role in assessing the child's oral health-related quality of life and making decisions about their health. The authors emphasised that parental unanimity on all aspects of treatment further establishes their position as the major decision-makers. In accordance with the aforementioned observations, Solanki et al. (2016) emphasised the need to assess parental viewpoints regarding the oral health of their children and the impact of dental interventions on their children's quality of life related to oral health.

According to Heidari et al. (2022), the use of GA for dental treatment in children is considered a reasonable option when other methods do not produce adequate results. Heidari et al. (2022) conducted a study that scrutinises dental procedures carried out under GA and the perspectives of parents on this approach for paediatric dental

patients. The data for analysis was collected using a survey that the parents completed by themselves (a self-administered survey). Heidari et al. (2022) found that certain crucial factors influence the adoption of GA for dental treatment in children. The factors, determined by parental agreement, include the child's tender age, prior occurrences of noncompliant conduct during dental procedures, and the substantial quantity of dental treatments required. Heidari et al. (2022) further proposed that various factors, such as the child's underlying medical conditions, parental reluctance to employ behavioural control techniques, the child's allegd academic success under anaesthesia, physical and mental behavioural issues, and the potential reduction in rehabilitation situation.

2.7 Outcomes and risks linked to the treatment using general anaesthesia

Ramazani (2016) stated that a significant number of paediatric children experience various degrees of problems after undergoing dental GA. Postoperative complications commonly mentioned include dental pain, feeding difficulties, nasal bleeding, throat and nose discomfort, sleep disturbances, weakness, fatigue, thirst, fever, nausea, vomiting, hoarseness, diarrhoea, and constipation. Pain after a surgical procedure is the most frequently cited issue. Ramazani (2016), found that 8.2% of paediatric patients undergoing dental GA experienced postoperative problems. Similarly, Farsi et al. (2019) argued that various factors, such as the specific treatment received, the length of GA, the execution of a traumatic insertion technique, the application of a double throat pack, the presence of pre-existing medical conditions, the healthcare practitioner's experience, and the use of LA, could contribute to the occurrence of post-operative difficulties. When comparing the effects of different treatment treatments on post-operative pain, studies have shown that putting on stainless steel crowns (SSCs) and tooth extraction are the most painful operations.

However, within a few days, the majority of post-operative grievances healed, and the recipients promptly resumed their regular and customary physical activities.

Campbell et al. (2018) study revealed that young, recalcitrant children frequently require GA, or deep sedation, to perform essential dental radiography and/or treatment. The medical procedure might be conducted at a hospital, ambulatory surgery centre, or office. Highly skilled practitioners who adhere to established protocols and recommendations can safely and effectively carry out treatment, even though negative outcomes from GA, deep sedation, or moderate sedation in dentistry offices are rare. The longest duration for dental surgery using the regularly employed paediatric entail moderate anaesthesia method with midazolam can range from 20 to 30 minutes. The approach may have limited effectiveness, but it still enables the culmination of treatment. Alternatively, it may prove unsuccessful. If a single sedation session cannot fully execute the medication plan, alternative options may include physically restraining the patient, employing an alternative method of moderate sedation, or resorting to GA. Generally, we recommend against using extra or alternative oral medication(s) for mild sedation due to their extreme volatility in the stomach, which increases the risk of unintentional profound sedation. GA enables the completeness of all required dental operations in a single appointment.

Further, Campbell et al. (2018) observed that paediatric patients' unwillingness to cooperate during dental rehabilitation operations and examinations, including the taking of radiographs, may hinder their dental treatment. The researchers conducted a retrospective evaluation of GA cases in a single private paediatric dentistry practice. Campbell et al. (2018) examined factors such as age, sex, height and weight, duration under anaesthesia, airway control method, magnitude of dental invasive procedure, recovery period, and occurrences of cardiac or pulmonary problems. In 2016,