Comparative Analysis of Pediatric Deep Neck Infection Management: A Systematic Review Comparing Conventional Medical Treatment and Surgical Intervention

Khoirul Anam[1*], Andre Niljon[2], Faishal Arief[2], Luthfi Ariwibiwo[3]

[1]Department of Otorhinolaryngology Head and Neck Surgery, Faculty of Medicine, Syarif Hidyatullah State Islamic University, Jakarta, Indonesia
[2]Faculty of Medicine, YARSI University, Jakarta, Indonesia
[3]Department of Otorhinolaryngology, Head and Neck Surgery, Faculty of Medicine, Muhammadiyah University of Jakarta, Indonesia
E-mail: khoirul.anam@uinjkt.ac.id

Abstract.
Background : Pediatric deep neck infections (DNI), including abscesses, constitute a serious clinical challenge due to their rapid progression and the risk of severe complications such as airway obstruction and sepsis. These infections are generally bacterial in origin and often arise from common ailments like tonsillitis or pharyngitis, spreading deeper into the neck area. The management of DNI involves two main approaches: medical therapy using antibiotics or surgical intervention to drain abscesses. However, selecting the most effective approach, whether medical or surgical, requires careful consideration, particularly concerning the patient's age, infection severity, and potential side effects. This study aims to provide a comparative analysis of both methods to assist clinicians in choosing the best approach for managing DNIs in children, thereby minimizing risks and achieving optimal recovery. Methods : This research used the Systematic Literature Review (SLR) method with guidance from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). PRISMA stages included the identification of relevant articles through databases such as PubMed, Google Scholar, and ScienceDirect using keywords "medical management" and "surgical management" for pediatric deep neck abscesses. Inclusion criteria encompassed English-language journals published between 2015 and 2022, focusing on studies that compared the effectiveness of antibiotic therapy and surgical interventions in pediatric deep neck abscesses. Identified articles were screened to eliminate duplicates and ensure compliance with inclusion criteria. The qualifying articles were then thoroughly evaluated, and relevant data were extracted, including study design, sample size, main outcomes, as well as complications and recovery rates associated with both methods. This approach was intended to provide an objective and comprehensive understanding of the efficacy of medical and surgical therapies in pediatric deep neck abscess cases. Results : The study revealed that the medical approach using antibiotics is effective for mild to moderate pediatric deep neck infections (DNI), particularly in small, uncomplicated abscesses. However, for larger abscesses or those with significant complications, surgical intervention yields better outcomes in controlling the infection and expediting recovery. Additionally, the use of dexamethasone in the medical approach can reduce the need for surgical intervention in some cases. A combination of antibiotic therapy and stringent monitoring proves appropriate for moderate cases, whereas early surgery is more advisable for cases exhibiting clinical instability or widespread infection. Conclusion: The management of pediatric deep neck infections should be individualized according to infection severity and clinical presentation. Medical treatment with intravenous antibiotics is effective for mild to moderate cases, particularly in small and uncomplicated abscesses, while surgical intervention is recommended for larger abscesses, clinical instability, or extensive infection. The adjunctive use of dexamethasone may reduce the need for surgery in selected patients. Therefore, an appropriate treatment strategy combining medical therapy, close monitoring, and timely surgical intervention can optimize clinical outcomes and minimize complications in pediatric DNI.

Keywords: *Pediatric deep neck abscess, Medical management, Surgical management and Comparative study.*

I. INTRODUCTION

Deep neck infections (DNIs) are severe infectious conditions involving the deep cervical fascial spaces that commonly arise as complications of upper respiratory tract infections or odontogenic infections, including tonsillitis, pharyngitis, and dental abscesses. Because these infections can rapidly spread through the interconnected fascial planes of the neck, they frequently lead to abscess formation that threatens vital

anatomical structures such as the airway, major blood vessels, and cranial nerves (Chen et al., 2022; Putra, 2020). In pediatric patients, DNIs represent a medical emergency due to their tendency to progress rapidly and cause life-threatening complications, including airway obstruction, jugular vein thrombosis, mediastinitis, and sepsis. Consequently, prompt diagnosis and appropriate therapeutic intervention are essential to reduce morbidity and mortality associated with these infections (Yusra & Yani, 2019).

The management of pediatric deep neck abscesses generally involves either conservative medical treatment or surgical intervention, with the choice of therapy depending on the severity of infection, abscess characteristics, and the patient's clinical condition. Medical management primarily consists of broad-spectrum antibiotic therapy aimed at eradicating pathogenic microorganisms and controlling inflammatory processes. This approach is generally recommended for patients presenting with relatively small abscesses, minimal clinical symptoms, or without evidence of airway compromise and systemic complications (Ningsih, 2022). Intravenous antibiotics, such as ampicillin-sulbactam or clindamycin, are frequently administered in hospitalized patients, particularly when oral treatment is considered insufficient. When patients demonstrate a favorable clinical response, antibiotic therapy alone may successfully resolve the infection without requiring surgical drainage. Nevertheless, careful clinical monitoring remains necessary to ensure adequate therapeutic response and to identify early signs of disease progression.

Conversely, surgical management focuses on evacuating purulent collections through incision and drainage procedures to achieve immediate source control of the infection. Surgical intervention is generally indicated for patients with large abscesses, extensive infection, failure of conservative treatment, or impending airway compromise. In complex cases involving deeply located cervical spaces, image-guided techniques or specialized surgical approaches may be required to minimize operative risks while ensuring complete drainage of the infected cavity (Izzati & Goni, n.d. 2022). Although surgery often provides rapid symptom relief and effectively prevents further spread of infection, it is also associated with potential postoperative complications, including secondary infection, hemorrhage, anesthesia-related risks, and scar formation. Therefore, determining the optimal treatment strategy requires careful evaluation of both the benefits and potential risks of surgical intervention.

Despite numerous studies investigating the effectiveness of medical and surgical treatments for pediatric DNIs, there remains considerable variation in reported clinical outcomes. Differences in patient characteristics, abscess size, disease severity, treatment protocols, and outcome measurements have resulted in inconsistent conclusions regarding the superiority of either therapeutic approach. Consequently, clinicians continue to face challenges in selecting the most appropriate treatment strategy that maximizes recovery while minimizing complications, hospitalization, and healthcare costs.

To address this knowledge gap, the present study conducts a systematic review of the existing literature comparing medical and surgical management of pediatric deep neck abscesses. By synthesizing current evidence, this study seeks to identify treatment trends, evaluate clinical outcomes, and provide evidence-based recommendations that may support clinicians in selecting the safest and most effective therapeutic approach for pediatric patients while reducing the risk of treatment-related complications and improving overall patient outcomes.

II. METHOD

Search Strategy

The included studies were sourced from the user’s provided journal articles, all of which were original research studies focused on human subjects. The population in the selected articles consisted with the majority being pediatric patients experiencing deep neck infections (DNI) with various types of abscesses, such as parapharyngeal, retropharyngeal, peritonsillar, and submandibular abscesses. These comprised both retrospective and prospective observational studies. The studies were originally indexed to international databases including PubMed, Google Scholar, and ScienceDirect. Articles were selected based on relevance, availability of full text, and fulfillment of inclusion criteria. The selection criteria in this research ensured that the analyzed population comprised patients treated with a medical approach using antibiotics, with or without dexamethasone, or through surgical intervention. These studies highlighted

various factors, including patient age, abscess size and location, and response to treatment methods, to evaluate the effectiveness of medical and surgical therapies in managing DNIs in the pediatric population.

The study selection criteria in this research included inclusion and exclusion criteria designed to ensure the relevance and quality of the analyzed articles. Inclusion criteria encompassed English-language journal articles published between 2015 and 2022 that specifically addressed the comparative effectiveness of medical (antibiotic) and surgical approaches in pediatric deep neck abscess cases. Selected articles were required to include data on clinical outcomes, complications, and recovery rates from each method. Meanwhile, articles that did not meet these criteria, such as studies on adult populations or those not including comparisons between medical and surgical approaches, were excluded. This selection process was intended to ensure that only relevant and high-quality articles were analyzed to produce comprehensive and reliable findings.

1. Search Strategy (PubMed)
   ((“Deep Neck Infection”[Title/Abstract] OR “Neck Abscess”[Title/Abstract] OR DNI[Title/Abstract]) AND (Pediatric OR Child OR Children)) AND (“Surgical Management”[Title/Abstract] OR “Medical Management”[Title/Abstract] OR Antibiotic[Title/Abstract] OR Treatment[Title/Abstract] OR Management[Title/Abstract]).
2. Search Strategy (Google Scholar, and ScienceDirect)
   ((“Deep Neck Infection”[Title/Abstract] OR “Neck Abscess”[Title/Abstract] OR DNI[Title/Abstract]) AND (Pediatric OR Child OR Children)) AND (“Surgical Management”[Title/Abstract] OR “Medical Management”[Title/Abstract] OR Antibiotic[Title/Abstract] OR Treatment[Title/Abstract] OR Management[Title/Abstract]).

Data Extraction

Data extraction in this study was conducted to collect relevant information from articles that met the selection criteria. This process was performed independently by fourth reviewers with verification by a fourth reviewer to ensure accuracy and consistency. The extracted data included several key elements, starting with key study characteristics (first author, year of publication, country, study design prospective or retrospective, sample size for both medical and surgical groups, and duration of follow-up). Additionally, supplementary information about patient characteristics was recorded, including mean age or age range and initial health conditions (e.g., presence of comorbidities), to understand the context of each study. Treatment-related data were recorded, detailing the specific methods used (e.g., medical therapy with specific antibiotic regimens, use of dexamethasone, type of surgical intervention such as I&D or needle aspiration), and the criteria used to select the treatment approach (e.g., abscess size, location). Outcome data encompassed the primary outcomes for comparative analysis, including efficacy of treatment (e.g., success/failure rates), complication rates (e.g., mediastinitis, airway compromise), length of hospital stay (LOS), duration of intravenous antibiotic use, and patient recovery rates.

III. RESULTS AND DISCUSSIONS

Study Selection

This study used a Systematic Literature Review (SLR) method guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) as seen in **Figure 1.** This method involves several systematic stages aimed at identifying, selecting, evaluating, and synthesizing relevant research to gain a comprehensive understanding of the effectiveness of medical and surgical therapies for pediatric deep neck abscesses [6]. The initial stage involved identifying articles through searches in scientific databases such as PubMed, Google Scholar, and ScienceDirect. These searches utilized specific keywords such as "medical management," "surgical management," and "pediatric deep neck abscess" to ensure the research was relevant to the studied topic. The search was restricted to journal articles written in English and published between 2015 and 2025 to ensure that the selected studies were the most recent and relevant to current clinical practice.

Fourth reviewers screened titles and abstracts using predefined criteria. Full texts of potentially eligible studies were retrieved and assessed independently. Disagreements were resolved through discussion

with a fourth reviewer. A total of 18.600 studies were identified from PubMed, Google Scholar & ScienceDirect. After the initial literature search across all databases (PubMed, Google Scholar, and ScienceDirect), a total of 18,194 records were initially retrieved. Following the removal of duplicate records, a manageable number of 56 unique titles and abstracts remained for screening. During the initial screening phase, 48 records were excluded for being clearly unrelated to the topic of comparative management in pediatric deep neck infections. In conducting this systematic review, eight relevant studies were successfully identified after reviewing abstracts and removing duplicates. These studies were selected based on their alignment with the objectives and inclusion criteria outlined in the methods section, specifically comparing the effectiveness of medical treatment (antibiotic therapy) and surgical interventions in managing deep neck abscesses in the pediatric population. **(Figure 1).**

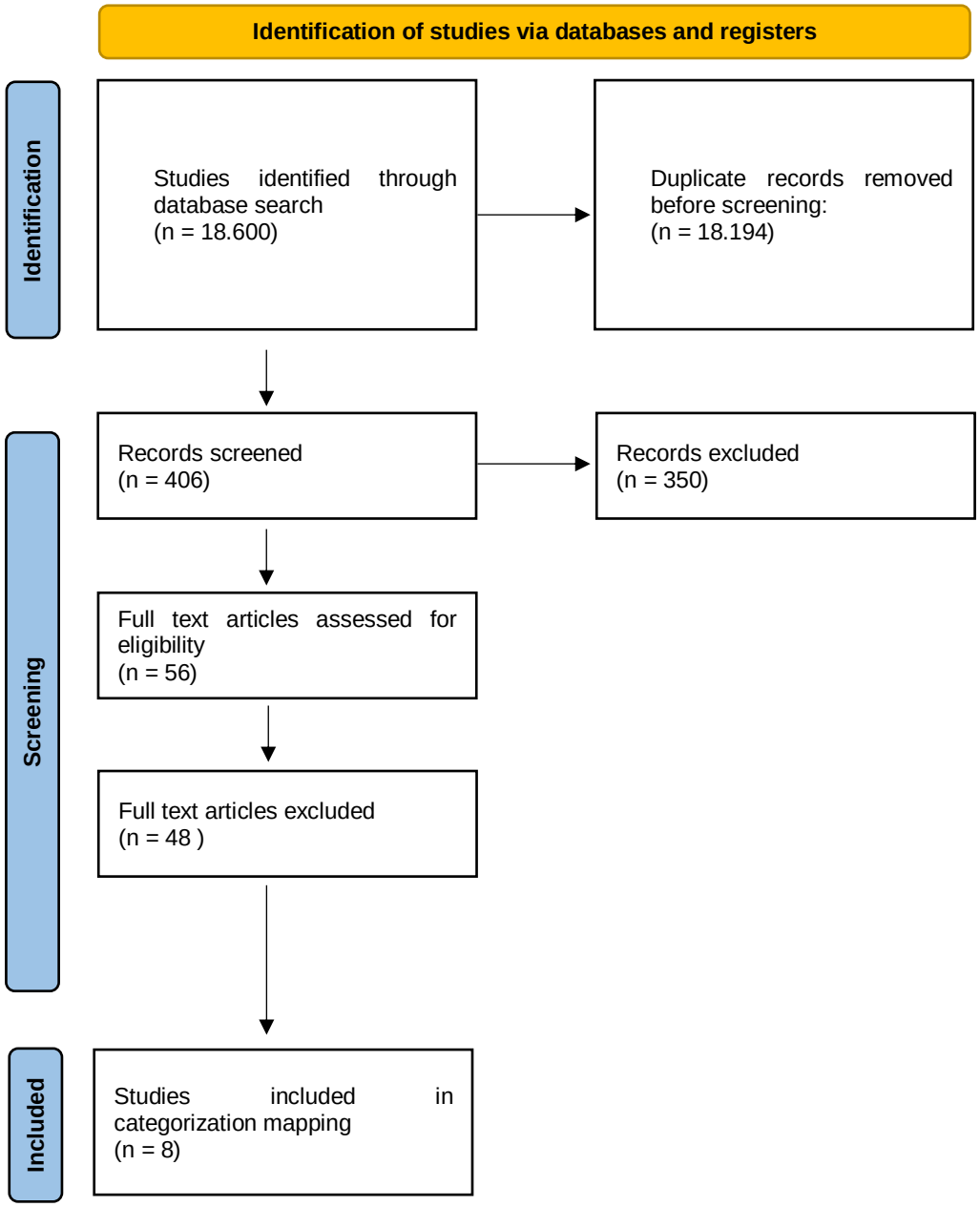

Fig. 1 Systematic Literature Review Diagram

Study Characteristics

Table 1 summarizes eight retrospective and comparative studies evaluating medical versus surgical management for pediatric Deep Neck Infections (DNI). Raffaldi et al. (2015) reported that antibiotic therapy was effective for mild cases, while large abscesses (>4 cm) required surgery. Wilkie et al. (2019) found that abscesses ≤2.5 cm could be managed medically, whereas larger collections required drainage. Sousa

Menezes et al. (2019) demonstrated that medical therapy, including steroids, was sufficient for most uncomplicated infections, but incision and drainage remained effective for complicated cases.

Tansey et al. (2019) compared the use of dexamethasone and found reduced surgical need in peritonsillar abscesses, although differences were not statistically significant. Maharaj et al. (2020) observed that in children, infections were generally less severe and more responsive to antibiotics compared with adults. Velhonoja et al. (2021) highlighted that early surgery (<48 hours) significantly shortened hospital stay in severe cases. Virbalas and Friedman (2021) recommended surgery for abscesses >30 mm or unstable clinical symptoms, though IV antibiotics were successful in most patients. Gehrke et al. (2022), involving mostly adults, demonstrated that mediastinal extension required aggressive surgical drainage. Across studies, medical management was consistently effective for mild-to-moderate DNI, while early surgery or combined therapy was superior for large, severe, complicated, or clinically unstable infections.

Title	Authors	Year	Country	Study Design	Sample	Patient Characteristics	Treatment Method	Infection Location	Treatment Duration	Antibiotics/ Surgical Indications	Study Outcomes
Diagnosis and management of deep neck infections in children: the experience of an Italian paediatric centre	Irene Raffaldi, Daniele Le Serre, Silvia Garazzino, Carlo Scolfaro, Chiara Bertaina, Federica Mignone, Federica Peradotto, Paolo Tavormina, Pier-Angelo Tovo	2015	Italy	Retrospective	60 patients	Ages 0-18 years, symptoms including fever and pain	Medical (antibiotics) and surgical	PTA, RPA, PPA, and mixed infections	Average 13.5 days	Beta-lactam, carbapenem + glycopeptide for severe cases, surgery for large abscesses (>4 cm)	The medical approach is effective for mild cases, surgery is recommended for large abscesses or those unresponsive to antibiotics; complications occurred in 5% of patients [7].
Defining the role of surgical drainage in paediatric deep neck space infections	Mark D. Wilkie, Sujata De, Madhankumar Krishna.	2019	UK	Retrospective, cohort analysis	93 patients	Children aged ≤16 years with parapharyngeal or retropharyngeal abscesses	Medical (antibiotics) and surgical	Parapharyngeal and retropharyngeal	Median 6 days	Abscess diameter >2.5 cm requires surgical intervention	Most deep neck infections can be managed conservatively if abscess diameter is ≤2.5 cm; surgical intervention is needed for larger abscesses, but outcomes are not dependent on pus drainage [8].
Management of pediatric peritonsillar and deep neck infections - cross-sectional retrospective analysis	Ana Sousa Menezes, Daniela Correia Ribeiro, Joana Rocha Guimara˜es, Anto´nio Fontes Lima, Lu´s Dias	2019	Portugal	Retrospective, cross-sectional	98 patients	Children aged 2–18 years with peritonsillar and deep neck infections	Medical (antibiotics + steroids) and surgical	Peritonsillar, parapharyngeal, retropharyngeal	Average 4.41 days	Amoxicillin-clavulanate + Clindamycin, or Ceftriaxone and Metronidazole if complications present	Incision and drainage effective with low morbidity; medical therapy sufficient for uncomplicated infections, majority of infections monomicrobial with Streptococcus Pyogenes as the main pathogen [9].
Dexamethasone Use in the Treatment of Pediatric Deep Neck Space Infections	James B. Tansey, John Hamblin, Madhu Mamidala, Jerome Thompson, Jennifer Mclevy, Joshua Wood, Anthony Sheyn	2019	United States	Retrospective, comparative analysis	153 patients	Children aged <18 years with DNSI, treated with antibiotics and/or dexamethasone	Medical: IV Antibiotics (Clindamycin, Ceftriaxone, Vancomycin) + dexamethasone in 35% of patients	Lateral neck, peritonsillar, retropharyngeal, parapharyngeal	Average 2.9-3.8 days	Dexamethasone associated with reduced need for surgical drainage in peritonsillar patients	The use of dexamethasone decreased surgical drainage rates in peritonsillar abscesses, average hospital stay was shorter (2.9 days vs 3.8 days), but overall results were not statistically significant. Dexamethasone was found to be safe in children with DNSI [10].
Deep Neck Space Infections: Changing Trends in Paediatrics versus Adults	Shivesh Maharaj, Sheetal Mungul, Sumaya Ahmed	2020	South Africa	Retrospective, comparative analysis	107 children, 52 adults	Children: average age 5.8 years; Adults: average age 40.9 years	Surgical: Abscess drainage via aspiration or surgery	Submandibular is most common in both groups	Children: 5 days; Adults: 9 days	Staphylococcus aureus is most common in children, polymicrobial in adults. 67% of adults HIV+	Children's infections were predominantly Staphylococcus aureus with high sensitivity to cloxacillin; adults had more severe infections with more frequent multispace involvement, longer hospital stays, and worse outcomes [11].
Early surgical intervention enhances recovery of severe pediatric deep neck infection patients	Jarno Velhonoja et al.	2021	Finland	Retrospective, comparative	42 patients	Children aged ≤16 years with severe DNI	IV antibiotics followed by surgery within the first 2 days or conservative treatment	Retropharyngeal, parapharyngeal	Median 6 days	Surgery <2 days for large abscesses or severe conditions, antibiotics cefuroxime & metronidazole	Early surgery (<2 days) significantly reduced length of hospital stay compared to delayed surgery; younger children more often required intensive care [12].
the management of suspected pediatric deep neck space	Jordan Virbalas & Norman R. Friedman	2021	United States	Retrospective, comparative	313 patients	Children with suspected DNSI undergoing	Medical management (IV	Retropharyngeal, lateral, parapharyngeal,	Average 3.7 days	Surgery for abscess >30 mm or if	IV antibiotics were successful in 72.5% of

infection						neck CT	antibiotics), surgery if abscess >30 mm	peritonsillar		clinical condition worsens after medical treatment	patients, with no significant difference based on abscess size. Early management with CT is recommended only in patients with signs of instability [13].
Deep neck infections with and without mediastinal involvement: treatment and outcome in 218 patients	Thomas Gehrke et al.	2022	Germany	Retrospective, comparative analysis	218 patients	Adult patients with deep neck abscess; 20.6% with mediastinal abscess	IV antibiotics (ampicillin/ sulbactam or cefazolin/ metronidazole), immediate drainage	Carotid, submandibular, mediastinal	8.98 - 39.78 days	Antibiotics adjusted if pathogens are resistant; immediate surgery for mediastinitis	Mediastinal abscesses required more drainage, tracheostomies, repeat CTs, and longer hospital stays; low mortality (1.83%) with applied multidisciplinary care algorithm [14].

IV. DISCUSSION

The review of eight journals analyzed in this study highlights a significant difference between the effectiveness of medical and surgical approaches in managing deep neck infections (DNI) in children. According to studies by Raffaldi et al. (2015) and Wilkie et al. (2019), the medical approach using intravenous (IV) antibiotics such as ampicillin-sulbactam, clindamycin, or beta-lactam combinations has proven effective in managing mild to moderate DNI cases, particularly in abscesses that are small or without major complications. These studies underscore that antibiotics are effective in controlling the initial infection and reducing the risk of further inflammation if administered during the early stages of the infection. However, they also recommend surgical intervention when abscesses exceed 2.5 cm or do not respond well to antibiotic therapy, due to the higher risk of complications in larger abscesses.

The study by Tansey et al. (2019) reinforces these findings, showing that the use of dexamethasone in antibiotic therapy can reduce the need for surgical intervention, especially in patients with peritonsillar abscesses. This study noted that patients treated with dexamethasone had shorter hospital stays compared to those who received only antibiotics, although this difference was not statistically significant overall. Meanwhile, the research by Sousa Menezes et al. (2019) indicates that in cases of peritonsillar infections and uncomplicated deep neck abscesses, medical therapy may be sufficiently effective, yet incision and drainage are recommended for patients with high morbidity, highlighting the importance of considering individual patient conditions in choosing a treatment method.

In more severe DNI cases, the surgical approach has proven to provide more effective outcomes, as demonstrated in studies by Velhonoja et al. (2021) and Gehrke et al. (2022). Velhonoja et al. emphasized that surgical intervention within the first two days after diagnosis results in faster recovery compared to later surgeries. Patients undergoing early surgery showed significant reductions in hospital stay duration and were less likely to experience complications. This aligns with the findings of Gehrke et al., who reported that abscesses extending to the mediastinum require planned surgical approaches with routine drainage to ensure safer recovery and avoid dangerous complications such as sepsis.

Maharaj et al. (2020) compared the management of deep neck infections (DNI) in children and adults, revealing that in children, infections were predominantly caused by pathogens such as Staphylococcus aureus, which are more responsive to antibiotic therapy, while adult patients were more likely to require surgical interventions due to more severe and multispace infections. This study emphasizes that therapy choices need to be tailored based on the age and severity of the infection.

Virbalas and Friedman (2021) also highlighted the importance of using imaging, such as neck CT scans, to determine the need for surgery in patients with abscesses larger than 30 mm or those showing signs of clinical instability after medical therapy. They found that intravenous antibiotic therapy was successful in most cases, but surgery remained advisable for larger cases or if antibiotic therapy failed to control the infection.

Overall, the results of this review indicate that the medical approach is effective for mild to moderate DNIs without significant complications, while the surgical approach becomes more effective for cases with large abscesses, severe complications, or infections that spread to the mediastinum. A combination of

antibiotic therapy with strict monitoring may be an option for moderate cases, but early surgery remains a priority for cases exhibiting clinical instability.

V. CONCLUSION

This study demonstrates that the medical approach using antibiotics is effective for managing mild to moderate deep neck infections (DNI) in children, particularly in abscesses that are small and without severe complications. However, in cases with large abscesses or severe complications, surgical intervention is more effective in preventing the spread of the infection and accelerating patient recovery. A combination of antibiotic therapy and strict monitoring can be an option for moderate cases, while surgical action is more advisable for cases exhibiting clinical instability or infections extending into the mediastinum. The use of steroids such as dexamethasone has also proven beneficial in reducing the need for surgery in some cases. Overall, the decision between medical and surgical therapy must be tailored to the severity and clinical characteristics of the patient to achieve optimal outcomes.

Several limitations in this study include variability in methodology and patient populations among the studies analyzed, which may affect the generalizability of the results. Moreover, most of the studies are retrospective, which poses limitations in variable control and may impact the validity of the outcomes. The broad age range of the patients, as well as differences in success criteria and complications among the studies, also add variability to the results. Further research with prospective designs and more uniform populations is needed to strengthen the findings and produce more definitive clinical guidelines for managing deep neck infections (DNI) in the pediatric population.

REFERENCES

[1]. Chen, S.-L., Chin, S.-C., Wang, Y.-C., & Ho, C.-Y. (2022). Factors affecting patients with concurrent deep neck infection and cervical necrotizing fasciitis. Diagnostics, 12(2), 443. https://doi.org/10.3390/diagnostics12020443

[2]. Gehrke, T., Scherzad, A., Hagen, R., & Hackenberg, S. (2022). Deep neck infections with and without mediastinal involvement: Treatment and outcome in 218 patients. European Archives of Oto-Rhino-Laryngology, 279(3), 1585–1592. https://doi.org/10.1007/s00405-021-06945-9

[3]. Izzati, U., & Goni, N. A. (2022). Evaluation of antibiotic use in surgical patients at RSPAU Dr. S. Hardjolukito Yogyakarta with the ATC/DDD system. ***Pancasakti Journal of Public Health Science and Research***, 2(1), 1–5.

[4]. Maharaj, S., Mungul, S., & Ahmed, S. (2020). Deep neck space infections: Changing trends in pediatric versus adult patients. ***Journal of Oral and Maxillofacial Surgery***, 78(3), 394–399. https://doi.org/10.1016/j.joms.2019.11.028

[5]. Ningsih, Z. T. (2022). Nyeri akut (Abses leher) pada Tn. Z di Ruangan Ruby Rumah Sakit Universitas Tanjungpura Pontianak (Undergraduate thesis). STIK Muhammadiyah Pontianak.

[6]. O'Dea, R. E., Lagisz, M., Jennions, M. D., Koricheva, J., Noble, D. W. A., Parker, T. H., Gurevitch, J., Page, M. J., Stewart, G., Moher, D., & Nakagawa, S. (2021). Preferred reporting items for systematic reviews and meta-analyses in ecology and evolutionary biology: A PRISMA extension. Biological Reviews, 96(5), 1695–1722. https://doi.org/10.1111/brv.12721

[7]. Putra, I. D. A. E. (2020). Karakteristik penderita abses submandibula di Departemen THT-KL RSUP Sanglah Denpasar. Medicina, 51(2).

[8]. Raffaldi, I., Le Serre, D., Garazzino, S., Scolfaro, C., Bertaina, C., Mignone, F., Peradotto, F., Tavormina, P., & Tovo, P.-A. (2015). Diagnosis and management of deep neck infections in children: The experience of an Italian paediatric centre. ***Journal of Infection and Chemotherapy***, 21(2), 110–113. https://doi.org/10.1016/j.jiac.2014.10.011

[9]. Sousa Menezes, A., Ribeiro, D. C., Guimarães, J. R., Lima, A. F., & Dias, L. (2019). Management of pediatric peritonsillar and deep neck infections: Cross-sectional retrospective analysis. ***World Journal of Otorhinolaryngology–Head and Neck Surgery***, 5(4), 207–214. https://doi.org/10.1016/j.wjorl.2019.04.003

[10]. Tansey, J. B., Hamblin, J., Mamidala, M., Thompson, J., McLevy, J., Wood, J., & Sheyn, A. (2020). Dexamethasone use in the treatment of pediatric deep neck space infections. Annals of Otology, Rhinology & Laryngology, 129(4), 376–379. https://doi.org/10.1177/0003489419890349

[11]. Velhonoja, J., Lääveri, M., Soukka, T., Hirvonen, J., Kinnunen, I., & Irjala, H. (2021). Early surgical intervention enhances recovery of severe pediatric deep neck infection patients. ***International Journal of Pediatric Otorhinolaryngology***, 144, 110694. https://doi.org/10.1016/j.ijporl.2021.110694

[12]. Virbalas, J., & Friedman, N. R. (2021). Impact of neck CT on the management of suspected pediatric deep neck space infection. ***International Journal of Pediatric Otorhinolaryngology***, 147, 110782. https://doi.org/10.1016/j.ijporl.2021.110782

[13]. Wilkie, M. D., De, S., & Krishnan, M. (2019). Defining the role of surgical drainage in paediatric deep neck space infections. Clinical Otolaryngology, 44(3), 366–371. https://doi.org/10.1111/coa.13315

[14]. Yusra, I., & Yani, F. F. (2019). Retropharyngeal abscess, submandibular abscess, and regio colli abscess with bronchopneumonia in a 2.5-month-old boy. Majalah Kedokteran Andalas, 42(3), 137–145. https://doi.org/10.25077/mka.v42.i3.p137-145.2019