Review Article

Effectiveness of Probiotics on Necrotizing Enterocolitis in Preterm Infants: A Narrative Review

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Abstract

Background: Necrotizing enterocolitis (NEC) is a devastating gastrointestinal emergency predominantly affecting preterm infants, contributing significantly to mortality and morbidity in neonatal intensive care units. Given the limitations of current treatments, the exploration of prophylactic strategies, including probiotic supplementation to modulate gut microbiota, has become a key area of research. **Objective:** This narrative review critically evaluates the evidence on the efficacy of probiotics in the prevention and treatment of NEC in preterm and very low birth weight (VLBW) infants. **Methods:** A systematic search was conducted in PubMed, Web of Science, and Google Scholar for articles published. Keywords included "Necrotizing enterocolitis," "Probiotics," and "prematurity." The review included peer-reviewed, full-text randomized controlled trials (RCTs) focusing on preterm infants and assessing the role of probiotics on NEC incidence, severity, and related outcomes. Seven RCTs met the final inclusion criteria. **Results:** The synthesis of seven RCTs revealed that five demonstrated a significant beneficial effect of probiotic prophylaxis. These studies reported a marked reduction in the incidence and severity of NEC, along with secondary benefits such as lower mortality, reduced sepsis, faster achievement of full enteral feeding, and shorter hospital stays. The most consistent positive outcomes were associated with formulations containing Bifidobacterium species (e.g., B. infantis, B. lactis), alone or in combination with Lactobacillus acidophilus. In contrast, two trials found no significant reduction in NEC incidence with Lactobacillus sporogenes or Saccharomyces boulardii, indicating that the benefits are likely strain-specific. **Conclusion:** The current evidence suggests that prophylactic supplementation with specific probiotics, particularly Bifidobacterium-based formulations, is effective in reducing the incidence and severity of NEC in preterm and VLBW infants. However, efficacy is not universal across all probiotic strains. Future research should focus on standardizing optimal strains, dosages, and treatment protocols, and include long-term safety and outcome assessments to guide definitive clinical practice recommendations.

Keyword: Necrotizing Enterocolitis, Probiotics, Preterm Infant, Very Low Birth Weight, Prevention, Neonatology.

Introduction

Necrotizing enterocolitis NEC is a serious illness that almost exclusively affects newborns [1]. Also, a serious gastrointestinal condition that typically affects preterm babies is imposed before their period of delivery [2]. The condition causes intestinal tissue to become inflamed, which leads to its death. (Necrotizing Enterocoli-

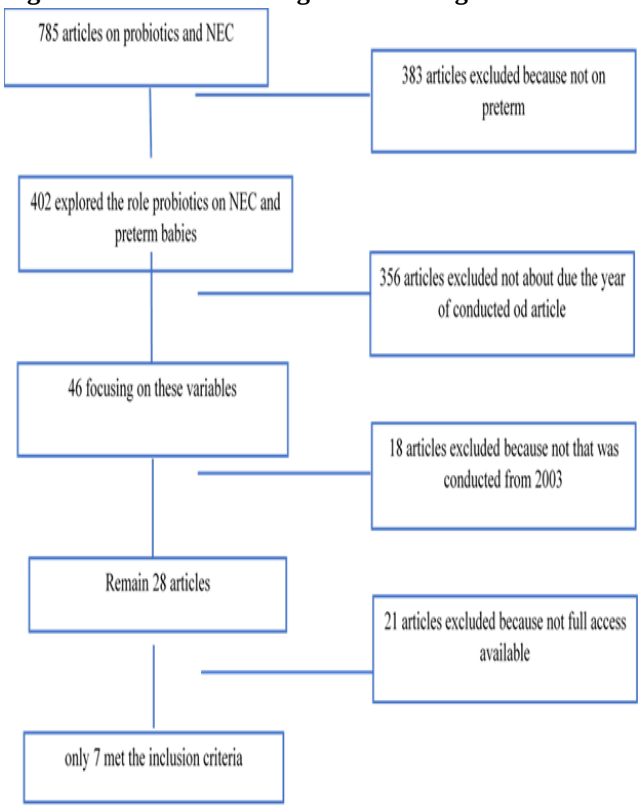
tis (NEC): What Is It, Causes & Treatment). The primary pathophysiology of NEC Changes from severe intestinal inflammation and ischemia [3]. The specific findings include full-thickness bowel tissue necrosis, perforation, and mucosal damage. The most common sites are the colon and terminal ileum, but in more severe cases, the entire gastrointestinal system is affected. (Neonatal Necrotizing Enterocolitis: Pathology and Pathogenesis) [4]. Worldwide, the incidence ranges from 0.3 to 2.4 per 1000 live births. Born before 36 weeks of gestation, preterm newborns contribute to roughly 70% of these instances [5]. The most well-known severe gastrointestinal emergency that happens in the NICU is NEC [6]. Infants weighing less than 1500 g at delivery have a 6% to 10% risk of NEC [7]. Although initially identified in 1965, the etiology and pathophysiology of NEC remain unresolved [8]. Possible reasons for NEC in an immature gut include difficulty digesting food, poor blood circulation, and inability to keep out harmful germs, insufficient intestinal structural barrier, and inability to activate typical metabolic defenses. Because preterm newborns may lack any or all of these capacities, they may be more prone to the forms of inflammation that contribute to NEC [9]. Parenteral feeding, prophylactic antibiotics, bowel rest, and intestinal decompression are popular therapies for neonates with NEC. Although surgery is typically required in newborns with perforations, primary peritoneal drainage has gained appeal as a replacement [10]. Probiotics are vitamins or supplements that contain living microorganisms intended to help or improve the good bacteria (normal microflora) in the body. Prebiotics are substances found in foods (usually high-fiber foods) that serve as nutrients for human microorganisms. Prebiotics are used to enhance the balance of gut bacteria. Also, probiotics come in many types, but the most common are Lactobacillus, which is found in yogurt and other fermented foods. A different kind of Bifido-bacterium may be found in various dairy products. It can relieve the symptoms of irritable bowel syndrome (IBS) and several additional illnesses, and Saccharomyces boulardii is a yeast present in probiotics. It appears to help with diarrhea and other digestive issues [11]. In accordance with the extensive Meta-Analysis research that was performed in Zhejiang Putuo Hospital, Zhoushan, China, the role of probiotics in managing NEC, with participating 12897 newborns, demonstrated that the effect of probiotics in avoiding NEC decreased the incidence of NEC, decreased the risk of death from the disease, and reduced the average days of hospitalization [12]. Also, the systematic review and meta-analysis of networks of randomly assigned Trials conducted in 2022, Canada, provided evidence that data from 63 investigated and 15,712 preterm infants showed that the effect of beneficial bacteria decreased severe NEC, diminished the number of days to reach full feeding, and overall reduced mortality and morbidity in premature, low-birthweight infants. The goal of this narrative review is to outline the role of probiotics in the prevention and treatment of NEC among preterm infants and to inform about the risks and benefits of probiotics, which may be helpful for those considering their use in preterm babies to prevent NEC, death, or sepsis.

Methods

In this narrative review, a systematic search was undertaken using databases such as PubMed, Web of Science, and Google Scholar, spanning the period from 2003 to 2014. Keywords used were "Necrotizing enterocolitis ", "Probiotics ", "prematurity ", "Gestational age," and "extreme premature infant", primarily in English-language

articles. Inclusion criteria consisted of papers focusing on preterm infants, documents evaluating the roles and effects of microorganisms in NEC, and research assessing the efficacy of these conditions. The term "preterm" refers to neonates who were born alive before reaching the age of 37 weeks of gestation. Preterm births can be classified into subcategories depending on the age of the pregnancy. Severely preterm (below 28 weeks), extremely preterm babies (28 to under 32 weeks), Preterm newborns at the middle to late stage (32 to 37 weeks) [13]. Exclusion criteria included studies not related to the topic or population of interest, journals without full-text availability or peer-reviewed status, and research with methodological flaws or inadequate data. Relevant information was gathered from the selected research, including the study design, sample size, and the outcomes assessed. The search yielded 785 publications on probiotics and NEC. Surprisingly, only 402 studied the function of probiotics in NEC and preterm children under the age of, with only 46 focusing on these factors, and that was a clinical and Randomized Controlled Trial among preterm. Further refining identified 28 papers published from 2003, of which only seven were full-text and met the inclusion criteria. All 7 Articles that were contained were Randomized Controlled Trials. These selected research studies are significant in understanding the function and efficacy of probiotics. Figure 1 shows the search strategies.

Figure 1: shows the strategies for finding articles.



Cases Review

The reviewed paper examines seven randomized clinical trials, of which 5 reveal a significant, favorable benefit of probiotics in both the prevention and treatment of NEC. These trials reveal a considerable reduction in death and morbidity amongst vulnerable groups, notably preterm infants and extremely low birth weight neonates. However, 2 of the analyzed trials show inconsistent findings, confirming that probiotics neither achieve significant outcomes in treating NEC nor reduce the associated risks. The first study examines the effect of preventive probiotic supplementation on the severity and frequency of NEC in preterm babies. The investigators conducted a controlled, randomized study (RCT) focusing on neonates with a birth weight below 1500 g. The study comprised 72 neonates in the study group and 73 infants in the control group. The treatment group received a daily food supplement containing a probiotic combination of Bifidobacterium infants and Streptococcus thermophilus, whilst the control group did not receive any additional feed supplements. The data indicated a considerable decrease in NEC frequency in the study group compared with the control group (4% vs. 16.4%, respectively), demonstrating that probiotic supplements had a

preventive effect. Furthermore, the probiotic-supplemented neonates exhibited a lower NEC severity than the control group. The control group had scores of 2.3 ± 0.5 according to Bell's criteria, but the study group had values of 1.3 ± 0.5. These data give additional evidence for the preventative benefit of probiotics. In the end, the study indicated that prophylactic probiotic supplementation in preterm newborns successfully reduced both the incidence and severity of NEC. These observations imply that controlling the gut flora by probiotics treatment could provide a natural strategy for resistance against NEC in extremely low birth weight infants [14]. The second trial explored the value of probiotics and prebiotics, alone or in combination (synbiotics), in preventing NEC in very low birth weight (VLBW) neonates. The study was a prospective, randomized, controlled experiment done at five newborn critical care organizations in Turkey. A total of 400 VLBW young children were assigned to four groups: a control group and 3 study groups consuming probiotic, prebiotic, or synbiotic substances added to breast milk or formula. The primary outcome evaluated was the rate of NEC. The results revealed that NEC rates were much lower in the probiotic (2.0%) and synbiotic (4.0%) groups, comparable to those in the prebiotic (12.0%) and placebo (18.0%) groups. Infants receiving probiotics, prebiotics, or synbiotics also demonstrated faster achievement of full enteral feeding, lower rates of contracted-at-home sepsis, shorter admissions to the neonatal intensive care unit, and lower mortality rates than the control group. In addition, the use of prenatal steroids and postnatal probiotics (alone or in synbiotics) reduced the risk of NEC, although maternal antibiotic exposure increased this risk. In consequence, the study revealed that probiotics (especially Bifidobacterium lactis) and synergistic bacteria (Bifidobacterium lactis + inulin) helped lower the incidence of NEC in VLBW newborns. In contrast, prebiotics (inulin) alone did not provide a relevant advantage [15]. Also, the third study emphasized the impact of probiotics and conducted an ongoing randomized, double-blind, placebo-controlled trial to assess the preventive effects of probiotics on reducing the risk of NEC in preterm newborns. The research comprised 186 newborns who were either receiving probiotics or not. The results demonstrated that the probiotic group had a markedly lower incidence of NEC, attained full enteral feeding sooner, and spent less time in the hospital than the control group. These findings demonstrate that enteral administration of prophylactic probiotics can prevent NEC-related morbidity and promote early completion of enteral feeding in extremely low birth weight newborns [16]. The following research was conducted as a prospective, masked, randomized controlled trial to examine the efficacy of probiotics in reducing the incidence and severity of NEC in VLBW newborns. The research covered VLBW newborns that were eligible after initiating enteral feeding and surviving beyond 7 days after delivery. The babies were randomly allocated to either the research group or the control group. The experimental group got Infloran, a blend of Lactobacillus acidophilus and Bifidobacterium infants, in addition to breast milk, while the control group received breast milk alone. The statistics suggested that the incidence of death or NEC fell considerably in the study group relative to the control group. Additionally, the incidence of NEC was also dramatically decreased in the research group. Notably, there were no occurrences of severe NEC in the research group. The study indicated that oral administration of Infloran as probiotics, combined with breast milk, reduced both the incidence and severity of NEC in VLBW newborns. Ultimately, the study showed that

probiotics may be an effective preventive strategy against NEC in extremely low birth weight infants when administered orally, in combination with breast milk [17]. The other research intended to investigate the efficacy of orally delivered probiotics in reducing NEC in VLBW preterm neonates. A randomized controlled trial was conducted with 434 newborns, who were assigned to either a study group receiving Bifidobacterium bifidum and Lactobacillus acidophilus or a control group receiving standard feeding. The primary result was death or NEC. The study found that probiotics significantly lowered the risk of death or NEC compared to the control group. No adverse impacts were detected. The study suggests that probiotics may help reduce the risk of NEC in VLBW premature neonates [18]. The papers that reported the contrast finding sought to assess the efficacy of orally administered Lactobacillus sporogenes in reducing the incidence and severity of NEC in VLBW neonates. The trial enrolled 221 VLBW newborns, who were allocated to two groups: a study group receiving L. sporogenes supplementation and a control group without supplementation. The results revealed that supplementation with L. sporogenes at a dose of 350,000,000 Colony-Forming Units (C.F.U.) per day did not significantly reduce the incidence of death or NEC in VLBW neonates. However, the probiotics group had a much lower incidence of food sensitivity than the control group. Feeding intolerance was identified in 44.5% of the beneficial bacteria group and 63.1% of the control group [19]. Another paper that discusses the effective use of probiotics examines the potential advantage of Saccharomyces bouvardia (SB) in preventing NEC or sepsis in VLBW neonates. The researchers undertook a prospective, double-blind, placebo-controlled investigation of preterm newborns with gestational age ≤32 weeks and birth weight ≤1500 grams. The investigation randomly assigned the neonates to receive either SB supplementation (50 mg/kg every 12 hours) or a placebo, from the first meal until discharge. The research group comprised 104 neonates, and the control group comprised 104 babies. The researchers analyzed the incidence of stage ≥2 NEC or death, and of stage ≥2 NEC or late-onset culture-proven sepsis, between the study and control groups. The study concluded that there were no significant differences between the two groups and the control group in terms of birth weight, gestational age, and the incidence of NEC or sepsis. The rate of newborns with stage ≥2 NEC or mortality was 9.6% in the study group and 7.7% in the control group, with a p-value of 0.62. Similarly, the percentage of newborns demonstrating ≥2 NEC or culture-proven late-onset sepsis was 28.8% in the study group and 23% in the control community, with a p-value of 0.34. The time necessary to reach 100 mL/kg/day of enteral feeding did not differ appreciably between the two groups. In the final analysis, the use of Saccharomyces boulardii did not result in a meaningful reduction in the incidence of NEC or sepsis in extremely low birth weight infants. Despite the putative advantages of probiotics in preventing NEC, this study did not provide substantial evidence for the use of SB supplementation in this context. Further investigation is necessary to uncover other strains and medications that may successfully lower the risk of NEC and sepsis in VLBW preterm babies [20]. The summary of the Studies is shown in Table 1.

Discussion

This review of seven randomized clinical trials examining probiotic supplementation for necrotizing enterocolitis (NEC) in preterm and very low birth weight (VLBW) neonates reveals

predominantly favorable outcomes. Five of the seven trials demonstrated significant beneficial effects of probiotics in both prevention and treatment of NEC, showing considerable reduction in mortality and morbidity amongst vulnerable populations. However, two trials yielded inconsistent findings, with probiotics neither achieving significant outcomes in treating NEC nor reducing related risks. The majority of the reviewed studies provide compelling evidence supporting the use of probiotics for prophylaxis to reduce NEC incidence and severity. The first trial involving 145 neonates with birth weight below 1500 g demonstrated that a probiotic combination of Bifidobacterium infantis and Streptococcus thermophilus significantly reduced NEC incidence from 16.4% in controls to 4% in the treatment group, while also reducing disease severity as measured by Bell's criteria (2.3 ± 0.5 in controls versus 1.3 ± 0.5 in the probiotic group) [13]. This finding suggests that modulating gut microbiota through probiotic intervention could provide a protective strategy against NEC in extremely low birth weight infants. The Turkish multicenter trial involving 400 VLBW neonates across five neonatal intensive care units provides essential insights into comparing different supplementation strategies [14]. This study revealed that probiotic supplementation with Bifidobacterium lactis achieved a 2.0% NEC rate. In comparison, a synbiotic combination (Bifidobacterium lactis plus inulin) resulted in a 4.0% NEC rate, both significantly lower than the prebiotic alone (12.0%) or the placebo (18.0%). Beyond NEC prevention, infants receiving probiotics or synbiotics demonstrated faster achievement of full enteral feeding, reduced hospital-acquired sepsis, shorter neonatal intensive care unit admissions, and lower mortality rates. Notably, the study found that prenatal steroids and postnatal probiotics reduced NEC risk, while maternal antibiotic exposure increased risk, highlighting the complex interplay among perinatal factors and gut microbiome developpment [14]. The third study, involving 186 extremely preterm neonates, reinforced these findings, demonstrating that prophylactic probiotic administration resulted in markedly lower NEC incidence, faster achievement of full enteral feeding, and shorter hospitalization duration compared with controls [15]. These outcomes suggest that enteral administration of prophylactic probiotics can prevent NEC-associated morbidity and promote early nutritional tolerance in extremely low birth weight neonates. The fourth trial examining Infloran, a combination of Lactobacillus acidophilus and Bifidobacterium infantis, demonstrated that probiotic supplementation combined with breast milk significantly reduced both the incidence and severity of NEC in VLBW neonates, with no severe NEC cases in the treatment group [16]. This finding emphasizes the potential synergy between probiotic supplementation and breast milk, which itself contains prebiotic oligosaccharides that may enhance probiotic colonization and effectiveness. The fifth positive study, involving 434 neonates receiving Bifidobacterium bifidum and Lactobacillus acidophilus, confirmed that probiotics significantly reduced the risk of death or NEC compared with controls, without any adverse effects [17]. The absence of safety concerns across these trials is critical, given the vulnerability of the target population and prior concerns about probiotic safety in immunocompromised hosts. However, two trials demonstrated contrasting findings that warrant careful consideration. The study examining Lactobacillus sporogenes in 221 VLBW neonates found that supplementation at 350,000,000 colony-forming units per day did not significantly reduce the incidence of death or NEC [18]. Interestingly, the probiotic group showed a con-

siderable decrease in feeding intolerance (44.5% versus 63.1% in controls), suggesting potential benefits in other clinical outcomes even when NEC prevention was not achieved. This discrepancy may reflect strain-specific effects, as Lactobacillus sporogenes differs substantially from Bifidobacterium and other Lactobacillus species used in successful trials. The study investigating Saccharomyces boulardii in 208 preterm neonates with gestational age ≤32 weeks and birth weight ≤1500 grams found no significant differences between treatment and control groups in rates of stage ≥2 NEC or mortality (9.6% versus 7.7%, p=0.62) or stage ≥2 NEC or late-onset culture-proven sepsis (28.8% versus 23%, p=0.34) [19]. Time to achieve 100 mL/kg/day enteral feeding also did not differ significantly between groups. This finding is particularly notable as Saccharomyces boulardii is yeast rather than a bacterial probiotic, suggesting that the beneficial effects observed with bacterial strains may not extend to fungal probiotics, or that different mechanisms of action require different organisms. The heterogeneity in outcomes across these seven trials likely reflects multiple factors, including strain-specific effects, dosing regimens, timing of intervention initiation, duration of supplementation, and baseline population characteristics. Successful trials predominantly utilized Bifidobacterium species (particularly B. infantis and B. lactis) alone or in combination with Lactobacillus species (particularly L. acidophilus), while unsuccessful trials used L. sporogenes and S. boulardii. This pattern suggests that not all probiotic organisms confer equal protection against NEC, and that species and strain selection are critical for clinical efficacy. The mechanism by which probiotics prevent NEC likely involves multiple pathways, including competitive exclusion of pathogenic bacteria, enhancement of intestinal barrier function, modulation of immune responses, and production of beneficial metabolites such as short-chain fatty acids. Bifidobacterium species are particularly well-suited to colonize the preterm infant gut and may be more effective at establishing stable colonization compared to other organisms. The preterm infant gut is characterized by delayed colonization, reduced microbial diversity, and increased susceptibility to pathogenic bacteria, creating an environment where probiotic intervention may be particularly beneficial. The synergistic effects observed in the Turkish trial [14] suggest that combining probiotics with prebiotics may enhance colonization and effectiveness, though prebiotics alone were insufficient. This highlights the importance of providing both the beneficial organisms and the nutritional substrate to support their growth and activity. The interaction with breast milk observed in several trials [16] further supports the concept that optimal outcomes may require consideration of the entire nutritional and microbial ecosystem rather than probiotics in isolation. Study limitations include variability in probiotic strains, doses, and formulations across trials, making direct comparisons challenging. Sample sizes ranged from 145 to 434 participants, with some studies potentially underpowered to detect modest treatment effects. The multicenter Turkish trial [14] provides the most robust evidence, given its larger sample size and multiple sites, though it included only 400 participants. Follow-up duration and outcome definitions varied, with some studies focusing primarily on NEC incidence and others examining broader outcomes, including mortality, feeding tolerance, and sepsis. The lack of long-term follow-up data in most trials limits understanding of potential sustained benefits or delayed adverse effects. The cumulative evidence from five positive trials supports probiotic supplementation as an effective prophylactic

intervention to reduce NEC incidence and severity in preterm and VLBW neonates, particularly when using Bifidobacterium-based formulations alone or in combination with Lactobacillus species [13-17]. The lack of efficacy observed with L. sporogenes [18] and S. boulardii [19] emphasizes that probiotic benefits are strain-specific and cannot be generalized across all probiotic organisms. Clinical implementtation should focus on evidence-based strain selection, with preference for Bifidobacterium infantis, B. lactis, and combinations with L. acidophilus. Future research priorities include identifying optimal probiotic strains, doses, and timing of intervention initiation through additional large-scale multicenter trials. Mechanistic studies examining how specific strains influence gut microbiome development, intestinal barrier function, and immune maturation would enhance understanding of probiotic effects. Long-term follow-up studies assessing growth, neurodevelopment, and immune function are needed to evaluate sustained benefits and potential delayed effects. Investigation of synergistic combinations with prebiotics and the role of breast milk in enhancing probiotic efficacy deserve further attention. Standardization of outcome measures and reporting across trials would improve comparability and enable more robust meta-analyses. Finally, cost-effectiveness analyses and implementation research examining optimal delivery strategies, quality control, and safety monitoring in routine clinical practice are essential for translating trial findings into sustainable clinical programs. Probiotic supplementation, particularly with Bifidobacterium-based formulations, effectively reduces NEC incidence and severity in preterm and VLBW neonates, with five of seven reviewed trials demonstrating significant benefits [13-17]. However, strain-specific effects are evident, as L. sporogenes [18] and S. boulardii [19] did not demonstrate significant NEC prevention. Beyond NEC reduction, probiotics improved feeding tolerance, reduced sepsis rates, shortened hospital stays, and decreased mortality in several trials. Clinical implementation should prioritize evidence-based strain selection with continued safety monitoring and investigation of optimal dosing strategies, timing, and combination approaches to maximize benefits for this vulnerable population.

Conclusion

The main goal is to demonstrate the beneficial impact of probiotics on NEC in newborns, particularly in preterm infants. According to the paper evaluated, probiotics are vital for preterm infants and all newborns, with prophylactic or therapeutic use for NEC prevention. Due to the incidence of NEC increasing dramatically today, it has a significant number of mortalities, has a considerable influence on children's overall health and future health, and the low cost and efficacy of probiotics, as evaluated in this field, have an essential and protective effect on the new generation in our community. Five publications were reviewed to establish the significant impact of prophylactic probiotic supplementation on reducing the incidence and severity of NEC in preterm and VLBW neonates. Another paper conducted an early analysis that incorporated a randomized controlled trial, specifically targeting preterm newborns with a birth weight below 1500 g. The outcomes of other studies demonstrated a substantial decrease in the frequency and severity of NEC in newborns who received prophylactic probiotics compared with the control group. This shows that taking probiotic supplements has a preventive impact. Subsequent studies addressed the effectiveness of synbiotics, prebiotics, and

probiotics in averting NEC in VLBW newborns. The results demonstrated that the probiotic and synbiotic groups had a significantly lower incidence of NEC than the prebiotic and placebo groups. It highlights the favorable effects of probiotics, particularly Bifidobacterium lactis, in reducing the incidence of NEC. Similarly, demonstrated comparable reductions in NEC incidence and severity with prophylactic measures, probiotic supplementation in preterm and VLBW babies. Overall, these studies underscore the potential of probiotics as an effective preventive therapy against NEC in preterm and VLBW infants, particularly when administered orally with breast milk. 2 of these articles reported opposite findings regarding the use of probiotics in therapy or as a protective factor against NEC. They revealed that supplementation with L. sporogenes at a dose of 350,000,000 (C.F.U.) per day did not significantly reduce the incidence of death or NEC in VLBW neonates. However, individuals taking probiotics had a much lower proportion of food sensitivities than the control group. Also, the research concluded that there were no significant differences between the study and control groups in terms of birth weight, gestational age, or the probability of NEC or sepsis. These studies together provide evidence that prophylactic probiotic therapy lowers both the incidence and severity of NEC in this susceptible population. The studies suggest that controlling gut flora through probiotic administration may serve as a natural protective strategy against NEC. However, the study identified critical gaps and potential for future research. Firstly, more studies are needed to determine the optimal probiotic strains, dosages, and treatment duration for maximum efficacy in preventing NEC. Further, the long-term effects and safety of probiotic use in VLBW babies warrant further investigation. In the future, investigations can address study issues such as the mechanisms by which probiotics demonstrate their protective advantages, the influence of probiotics on gut microbiota composition, and possible interactions between probiotics and other medicines (e.g., prebiotics). Hypotheses may be generated to examine whether specific probiotic strains or combinations are more effective at preventing NEC, and whether probiotic supplementation might improve overall clinical outcomes in VLBW newborns beyond NEC prevention. Addressing these information gaps can significantly benefit the medical sector by providing evidence-based guidelines for the use of probiotics in VLBW newborns. It would assist healthcare practitioners in making informed decisions about probiotic supplementation, thereby improving outcomes and reducing morbidity from NEC. Moreover, addressing the underlying processes and strengthening probiotic therapies can pave the way for targeted, customized probiotic therapies in the future, thereby improving the overall health and well-being of preterm neonates. Nursing plays a significant role in the prevention, evaluation, and treatment of NEC in preterm babies. Nurses provide precise monitoring, rapid interventions, and supportive care to reduce risk factors, detect early signs, and encourage appropriate treatment, thereby improving outcomes and reducing morbidity and mortality.

Declarations

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data curation. ZMA drafted the manuscript. MHS and MOQ revised the manuscript. HHR and MOH supervised the review. All authors have read and approved the final manuscript.

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Table 1: Summary of studies included in the study

Article Title and Reference	Journal	Gestational Age	Duration of Study	Sample Size	Main Finding
[14]	The Journal of Pediatrics	30 ± 3 weeks vs 29 ± 4 weeks	9, 2001 to 9, 2004	145 babies	**Probiotics may help protect against NEC by altering the gut microbiome.**
[15]	The Journal of Pediatrics	<32 weeks	June 2011 to June 2014	300 children	**Supplying oral probiotics to premature neonates reduced the risk of NEC by 50%.**
[16]	Journal of Tropical Pediatrics	<32 weeks	October 2007 and March 2008	186 preterm	**Prophylactic probiotics in a neonatal critical care unit may help lower morbidity from necrotizing enterocolitis in infants.**
[17]	American Academy of Pediatrics	28.5 ± 2.5	July 1, 1999, to Dec 31, 2003	367 VLBW infants (180 in study group, 187 in control group)	**Compared with the control group in this study, the incidence of NEC was significantly reduced.**
[18]	American Academy of Pediatrics	less than 34 weeks	January 1, 2005, to May 30, 2007	443 infants	**For extremely low birth weight preterm infants, probiotics minimized the probability of death or necrotizing enterocolitis.**
[19]	European Journal of Clinical Nutrition	<32 weeks	October 2008 and June 2009	total of 221 infants (110 in the study group and 111 in the control group)	**Supplementing VLBW newborns with probiotics does not lower the risk of mortality or NEC, although it may increase feeding tolerance.**
[20]	Early Human Development	infants (gestational age ≤32 weeks)	October 1, 2010, to November 30, 2011	244 infants were enrolled in the study	**Probiotics did not reduce Sepsis or NEC incidence**