

Benefits of Probiotics on Enteral Nutrition in Preterm Neonates: A Systematic Review

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Abstract: *Babies born early still face serious health risks around the world, creating ongoing strain on hospital newborn units. Because their digestive systems aren't fully developed, these tiny infants often struggle to feed properly, fall behind in weight gain, and are more likely to get very sick from gut-related issues like NEC or infections. Feeding through the gut helps them grow stronger while also training their intestines to work better over time. Lately, helpful bacteria known as probiotics have drawn attention for possibly balancing gut life and making feeding easier for small preemies. A close look at past studies was done to see how well probiotics actually support feeding progress in early-born babies cared for inside certain hospitals and special baby wards. From 2015 to 2026, research on preterm babies in hospitals who got probiotics was pulled together using standard methods. PubMed, Scopus, Web of Science, Cochrane Library, along with Google Scholar formed the base for finding these studies. Details such as type of probiotic used, how feeding went, whether NEC occurred, cases of infection, growth numbers, plus time spent in hospital were gathered carefully. Full milk feeding happened faster where probiotics were part of care. Feeding upset dropped down; babies handled their meals better when given helpful bacteria. Fewer infants developed NEC after taking supplements designed to support gut balance. Late infections showed up less often among those receiving microbial help during early days. Weight climbed at a stronger pace once good microbes entered daily nutrition plans. Stays in intensive units shrank somewhat under consistent use of certain live cultures. Yet differences popped up across reports - strains varied, amounts changed, timing wasn't fixed. Still, most data leaned one way: useful bugs made a real difference in how tiny newborns ate and grew. Most likely, adding probiotics to feeding plans for premature babies could help their immediate health plus long-term development. Still unclear is how best to use them across hospitals without consistent methods in place yet. What follows should be more large-scale studies spread over many centers to settle on clear guidelines everyone can follow.*

Keywords: Probiotics, Preterm Neonates, Enteral Nutrition, Feeding Tolerance, Necrotizing Enterocolitis, NICU, Systematic Review

1. Introduction

Before 37 full weeks of pregnancy, a baby's early arrival brings serious health risks across the globe. Around 15 million little ones enter the world too soon every year, says WHO in 2023. These newborns often need careful medical support right after birth. Instead of skipping straight to complex formulas, feeding through the gut helps their digestive systems develop properly. Growth gets stronger when nutrients come in the way nature intended. Better recovery paths emerge when digestion starts gently. Tiny bodies respond well to steady nourishment.

Little babies born too early usually struggle with eating because their stomachs and intestines aren't fully ready yet. Since digestion moves slowly, food stays in the belly longer, which can cause discomfort. Their gut muscles do not work smoothly either, making it harder to process milk. On top of that, the lining inside their intestines is weaker than in full-term infants. Because of these issues, many cannot tolerate regular feedings at first. Reaching a point where they take all nourishment by mouth takes much more time. They often need IV nutrients instead of relying only on gut feeding. As a consequence, they tend to stay in the hospital far longer (Morgan et al., 2020).

Most tiny lives start with unseen helpers inside the gut shaping body defenses. When babies arrive too soon, those microbes sometimes fail to settle in right. Medicine use at birth can block their path. So might entering the world through surgery instead of naturally. Time spent under hospital lights matters. Feeding without mother's milk changes things too. Missing these pieces links to belly troubles later on. Tiny invaders find it easier when balance slips. Evidence shows this pattern clearly (Underwood, 2019).

Living microbes called probiotics can boost health if taken in proper doses. Strains like *Lactobacillus* or *Bifidobacterium* work by balancing gut life, strengthening the intestine's shield, even fine-tuning immunity (Hill et al., 2014). Earlier research hints these supplements might ease feeding issues, lower risks of NEC, cut down late infections, while aiding growth in premature babies (Sharif et al., 2022).

This review looks at how probiotics affect feeding success in premature babies getting tube nutrition in hospitals, especially focusing on digestion issues. One key point is whether these supplements help prevent a serious gut problem called NEC. Growth patterns are also part of the picture when checking results. Time spent in the hospital gets measured too. Attention goes mainly to NICU settings where tiny newborns receive intense medical support.

2. Methodology

Following PRISMA 2020 standards helped keep the process clear and carefully structured (Page et al., 2021). PubMed along with Scopus, Web of Science, Cochrane Library, and Google Scholar supplied sources through a broad search. Work appearing from 2015 up to 2026 made the cut if it met entry conditions.

Searching began by pulling together terms like Probiotics, *Lactobacillus*, *Bifidobacterium*, Preterm Neonates, Enteral Nutrition, NICU - linked through standard logic rules. From there, more useful papers came up when checking citations by hand.

Included research focused on babies born before 37 weeks' pregnancy. These took place inside hospitals or intensive care units for newborns. The work looked at giving beneficial bacteria during feeding. Outcomes tied to gut health and

digestion appeared in the results. Trials that randomly assigned infants to groups qualified, so did observational studies following patients over time. Only papers written in English counted toward analysis. Research done on animals didn't make the cut. Reviews summarizing past findings were left out. Opinion pieces by experts weren't considered either. Short summaries presented at meetings lacked detail needed. Reports about single patients also fell outside scope.

First up, titles and abstracts got a quick look. Then came reading entire papers that seemed relevant. Information pulled out covered who wrote it, when, where they worked, how the research was set up, number of people involved, what kind of probiotic was tested, along with main health results seen. To check how solid each study was, reviewers turned to the Cochrane tool for spotting bias risks, also used CASP's evaluation list. Each step helped weigh whether findings could be trusted.

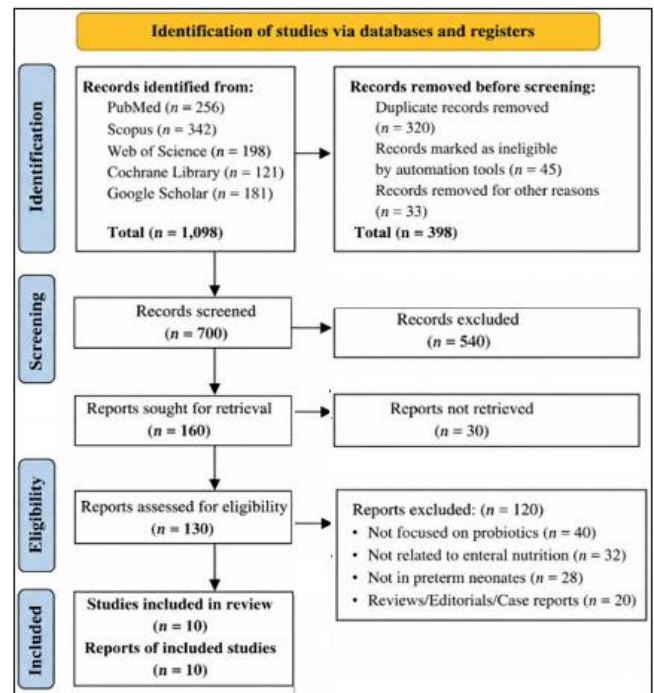


Figure 1: PRISMA Flow Diagram

3. Results

Ten studies fit the requirements and went into this analysis. Held at advanced medical centers and special baby wards, these projects took place in several countries - places like Australia, Britain, India, China, Turkey, South Korea, and Denmark. Most looked at premature infants fed probiotics through tube meals, using trial designs or group-based tracking methods.

Table 1: Summary of Included Studies

Author (Year)	Country	Study Design	Probiotic Strain	Sample Size	Key Outcomes
Jacobs et al. (2016)	Australia	RCT	Bifidobacterium & Lactobacillus	1099	Reduced NEC incidence and improved feeding tolerance
Costeloe et al. (2016)	United Kingdom	RCT	Bifidobacterium breve	1315	Improved enteral feeding outcomes and gastrointestinal health
Rao et al. (2017)	India	RCT	Lactobacillus acidophilus	180	Faster achievement of full enteral feeding
Athalye-Jape et al. (2018)	Australia	Cohort Study	Multi-strain Probiotics	420	Reduced late-onset sepsis and improved gut colonization
Olsen et al. (2018)	Denmark	RCT	Lactobacillus reuteri	350	Improved feeding tolerance and reduced gastric residuals
Chang et al. (2019)	China	Cohort Study	Multi-strain Probiotics	275	Enhanced weight gain and nutritional status
Demirel et al. (2020)	Turkey	RCT	Lactobacillus rhamnosus	210	Reduced sepsis incidence and improved feeding outcomes
Kim et al. (2021)	South Korea	Cohort Study	Bifidobacterium species	195	Shorter NICU stay and improved growth outcomes
Sharif et al. (2022)	Multicenter Study	Evidence Review	Multiple Strains	850	Significant reduction in NEC and mortality risk
Patel et al. (2023)	India	RCT	Multi-strain Probiotics	250	Improved enteral nutrition and reduced hospitalization duration

Some of the research showed babies born early had better results with tube feeding when given probiotics. Instead of just usual care, those getting helpful bacteria handled milk feeds more easily. Reaching full feeding happened sooner in many cases where probiotics were part of daily routine. Better gut movement and digestion stood out in these infants too. For instance, work by Rao in 2017 along with findings from Olsen

two years later noted a quicker shift toward complete feeding than seen without added microbes.

Some research showed fewer serious newborn health issues. A 2016 study by Jacobs, along with later work from Sharif in 2022 and Patel in 2023, pointed to less necrotizing enterocolitis. In another direction, findings from Athalye-

Jape (2018) and Demirel (2020) highlighted reduced cases of late-onset infections in babies given probiotics.

One more thing - better growth numbers showed up across tests. Weight climbed higher, nutrition got stronger, results from Chang and team in 2019 backed that, so did Kim's group two years later. Time spent in intensive care dipped lower when probiotics entered the picture. Recovery seemed quicker, bodies steadier medically. Taken together, tiny newborns given helpful bacteria handled feedings better, ran into fewer issues, put on size, stayed healthier overall.

4. Discussion

Most studies point to probiotics helping premature babies digest milk better. Feeding goes smoother when good bacteria are added to their diet. Reaching full feeds sooner means less time on IV nutrition. This shift cuts risks tied to long-term vein-based nourishment. Fewer issues pop up when gut function improves early.

One thing stands out across multiple studies - fewer cases of necrotizing enterocolitis. Premature babies still face NEC as a severe gut condition, so stopping it early matters deeply in newborn care. With probiotics, balance in gut microbes improves, the gut lining resists damage better, while inflammation gets kept in check, research shows (Underwood, 2019).

One way babies might stay healthier is through better gut bacteria. This happens when good microbes take hold early. Not every newborn gets sick as often if they have certain supplements. Protection could come from how these tiny organisms interact inside the intestines. Sometimes fewer infections appear in infants given specific strains. What grows in the gut often shapes how immunity builds up. Harmful germs find it harder to survive when helpful ones are present. Changes in bacterial balance may quietly strengthen defense systems over time.

Later recovery times mean babies leave the hospital sooner, showing how useful probiotics can be. Because digestion works better, infants take in nutrients more effectively, which supports steady weight increase. When stays get shorter, hospitals spend less, family stress drops too. Growth improves not just because of supplements, but due to stronger internal processes building from early support.

Even with good results, differences in probiotic types, how much was given, how long treatment lasted, and who was studied make it hard to compare research directly. One study might test just one strain while another combines several. To find the best approach and agree on clear guidelines, more big, wide-reaching trials across many centers are needed.

5. Conclusion

Looking at many studies shows probiotics might really help tiny babies in hospitals get better from tube feeding problems. Evidence points to fewer belly issues when these newborns take helpful bacteria early on. Reaching full milk feeds happens faster, which means less time waiting. Infections that start later are seen less often in those given probiotics. Growth

looks stronger too across several reports. Stays in the hospital tend to be shorter for infants who receive them. Using good microbes could become part of regular care plans for fragile newborns. Still, every trial uses different blends or methods, making clear rules hard to build. Big joint efforts with strict designs will clarify what works best overall. Picking the right microbe type matters just as much as how much and how long it is used. Watching how these treatments affect little ones far down the line remains key moving forward.

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