



Indonesian health care practitioner's perception on gut-brain-axis and social-emotional concept

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Abstract

Background The microbiome-gut-brain-axis (GBA) concept has long been appreciated. It is recognized that the microbes resident in the gastrointestinal tract can influence brain physiology and the social-development competencies, and vice versa. Therefore, it is crucial for health care practitioners (HCPs) to understand this concept, especially in children; however, no study has been reported.

Methods: This study used qualitative methods to explore HCPs' perception and awareness about the microbiome-GBA concept. Data were collected through in-depth interviews using online video calls with HCPs, including general practitioners, pediatricians, and midwives.

Results: We found that responders are aware of the microbiome-GBA concept, as this issue is often discussed in seminars and other events. They realized that gut health is a significant concern, and it is significantly impacting brain health and leads to social and emotional development (SED). This process starts from the early stages of life.

Conclusion: The HCPs in our study have a good perception of the microbiome-GBA concept, e.g., a healthy brain is not possible without a healthy gut. As far as we are concerned, this is the first study to investigate the knowledge of HCPs about bidirectional communication of microbiome-GBA as an essential factor in child management.

Keywords gut microbiota, gut-brain axis, HCP perception, social-emotional

Introduction

Growth and development are central characteristics of childhood with a complex interaction of closely regulated genetic, hormonal, and environmental factors that prepares an organism for survival.^{1,2} Up- and downward growth deviations from normal patterns may reflect serious disorders, such as endocrine conditions, infectious or inflammatory diseases, and psychosocial deprivation.² Exposures to putative pathogens at an early stage of physical, immunologic, and cognitive development may

adversely disrupt a child's potential development trajectory, resulting in long-lasting consequences.³

The causes of poor growth and development in early childhood are complex, including a lack of adequate amount or quality of food, early termination of breastfeeding, the inadequate response of the host and the host's gut microbial to caloric insufficiency, and a configuration of the microbiota that is suboptimal for nutrient harvest.³ It is now widely recognized that early growth and tissue development during the first 1,000 days of human life and beyond are significant predictors of long-term health and performance up to adulthood and old age.²

Fetal growth is influenced by maternal, placental, and genetic factors. Poor intrauterine growth is associated with developmental delays and increased risk for different mental health problems.

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Experiences that occur during the first years of life will permanently modify brain structure and function and consequently affect the susceptibility to mental disorders.⁴

Peripartum adverse events are also considerably known to affect neurodevelopmental outcomes.⁴ Early microbial colonization triggers processes that result in intestinal maturation and immune priming. Mode and place of delivery are critical to shaping the infant gut microbiota with potential health consequences. The results highlight both the importance of host-microbial contact during the first month of life and the dynamism of the process.⁵

In recent years, we have seen the emergence of microbiota as one of the critical regulators of gut-brain function and has led to a distinct microbiota-gut-brain axis.^{6,7} Bidirectional communication between the gut microbiome and the brain can occur across physiological channels, including neuroendocrine and neuroimmune pathways and the autonomic nervous system, and bacteria within the gut can produce neurotransmitters that can also be found within the central nervous system (8-10). For example, evidence suggests that a strain of *Lactobacillus brevis* can produce GABA. Monoamines play a crucial role in brain-gut-microbiome axis signaling; serotonin, a key target in treating major depression.⁹

Strikingly, initial evidence suggests that the diversity of the gut microbiota may also be related to brain structure. Emerging research suggests that gut microbiota has impacts on social behavior. Evidence of altered social behavior in germ-free animals is complemented by evidence indicating that children with autistic spectrum disorder have a gut microbial profile that differs from controls. The immune pathway within the brain-gut-microbiome axis may be a plausible mediator of the effects of this axis on social behavior, as cytokine-induced sickness behavior is associated with social withdrawal.⁹

Determining the dynamics of the behavior-gut associations in early life is important because many physical and mental health conditions have early life antecedents. The gut microbiome may be more malleable in early life. However, by approximately two years of age, gut microbiota profiles resemble profiles found in adults, which are relatively stable.¹¹ Early stress in life can also have long-term

effects on gut microbiota composition.⁸ Thus, assessing the gut microbiome as early as two years of age may provide insight into long-term functioning.¹¹

Based on those explanations above, we believe it is crucial for health care practitioners (HCP) to have a proper and in-depth understanding of GBA and SED in early childhood. Surprisingly, as far as we know, no study has been done to investigate this issue yet. Pediatricians, general practitioners, and midwives are front-line HCPs who face infants or toddlers daily. Therefore, it is very important to explore the HCPs' (pediatricians, GPs, and midwives') perception and awareness of the GBA and its relationship with the SED concept among infants or toddlers.

Methods

Study design

As the study focused on investigating perception and awareness, a qualitative design was chosen; this suited the study's exploratory nature and provided the best fit for the research questions.¹² This qualitative study used in-depth interview via online video call with HCPs. Data were collected on January 2021.

Sample and recruitment

Health care practitioners in this study include pediatricians, GPs, and midwives. Their age is between 35 – 60 years old, with experience duration more than six years in their specialization, and either working in a public or private hospital. Randomization of the subject study was based on the year experience, affiliation, and the number of patients. No specific qualification to justify the number per HCP. 12 HCPs were interviewed, consisting of 2 pediatricians, 6 GPs, and 4 midwives; 8 women and 4 males.

Procedure

Expert interviewers ran interviews via online video calls. Subjects were invited to share their perception of GBA and SED concepts in infants or toddlers. All interviews were recorded. Consent was obtained in

writing before the interview, while verbal consent to record the discussion was obtained prior to each session.

Data analysis

All data obtained from in-depth interviews were recorded. A qualitative approach was used to improve the understanding of HCPs' views and perceptions regarding GBA and SED concepts in infants or toddlers.

Results

Overall understanding about GBA and SED concepts among HCPs

The gut-brain axis and its relation with social-emotional development in early life are well known among the HCPs recruited in this study. They said that this issue was often introduced and discussed with them through seminars or other events.

The importance of the GBA and SED concepts

According to the HCPs interviewed, the knowledge about GBA and SED concepts in infants or toddlers is a significant concern. They stated that gut challenges are the main challenges faced in infants' early months. They often face problems such as diarrhea, indigestion, allergies, and others. Therefore, HCPs need to understand these concepts to relate them with daily practices and give appropriate management to patients.

The knowledge of GBA and SED concept among HCPs

Next, we asked the HCPs how far their knowledge about this concept is. They agreed that the idea of GBA is very relevant to their daily practices. They have successfully established the need for gut health in the early stages. Gut health significantly impacts brain health; if the gut is not healthy, nutrients are not well absorbed and will adversely affect brain growth and development. In other words, brain health is not possible without a healthy gut. Furthermore, the HCPs also realized that there is no

good SED without physical growth and development of the brain.

What can be improved from the concept according to HCPs

Finally, we asked the HCPs for their suggestions on what can be improved from the concept. The knowledge about GBA and SED itself is not compellingly new. Therefore, they suggested reinforcing the benefit of gut and brain health in the early stages of a child's life as a reminder to HCPs. Furthermore, it is better to reiterate the examples of contents that have been reported to have a good impact on the concept, such as omega, amino acid, docosahexaenoic acid (DHA) in the right proportions for brain health, and fructooligosaccharides (FOS), galactooligosaccharides (GOS), also prebiotics for gut health. These contents can be found easily in various baby milk or food.

Discussion

This study is the first known to the authors to investigate the perception of HCPs (pediatricians, general practitioners, and midwives) about the strong relationship between healthy gut to support brain and social-emotional. We use qualitative study using in-depth interviews because qualitative methods can help bridge the gap between scientific evidence and clinical practice.¹³

Interestingly, the HCPs involved in this study are well-known with the concept of GBA and its correlation with SED development which starts in early life. They are also aware of the bidirectional communication between gut and brain; gut health is one of the foundations of brain and social-emotional development. The responders have plenty of exposure to this topic. By knowing this important concept, it is expected that the treatment and management of either gastrointestinal (GI) or social-emotional diseases will have better results. It has been proposed that a multidisciplinary treatment approach between biological and psychological processes is most likely to be effective and well-received.¹⁴

We think the next important task for HCPs is to communicate this message to patients or parents in

practice. Indeed, it has been reported that children whose parents accept a biopsychosocial conceptualization of gastrointestinal problems and their treatment are more likely to experience symptom improvement. Moreover, based on the biopsychosocial model, patients with GI disorders and their families will be equipped with the foundation necessary for reducing symptoms by impacting the brain-gut axis through behavioral strategies.¹⁴

Next, our responders suggested that the HCPs should be often reminded of this concept for reiterating purposes. Indeed, there are significant associations between physician knowledge and practice outcomes. For example, the knowledge-based certification internists and cardiologists have 19% lower mortality rates of their patients following an acute myocardial infarction.¹⁵ An educational follow-up experiment with knowledge retention measured at assigned time intervals (0–55 days) after an online tutorial showed that mean knowledge scores increased from 50% before the tutorial to 76% among those tested immediately afterward. Score gains were half at 3–8 days, and no significant retention was measurable at 55 days. To achieve longer-term retention, physicians should review or otherwise reinforce new learning after as little as one week.¹⁶ A study was conducted to evaluate the knowledge retention among midwives in Indonesia after providing digestive health (e.g., gut health is an important issue in which there is a role of nutrition to gut health and brain axis), nutrition, and parenting education sessions. At baseline, less than 50% of the subjects had sufficient knowledge of the issues. There were significant improvements in the proportion of adequate knowledge immediately after and after three months, which declined after three months compared to the immediate group.¹⁷ Thus there is a need to do regular and periodic refreshments, especially to topics that are not applied regularly, to retain the knowledge.

Another exciting issue mentioned by the responders is the knowledge of omega, amino acid, docosahexaenoic acid (DHA) in the right proportions for brain health, and FOS, GOS, also prebiotic for gut health. Indeed, there is quite a lot of information about the “good” nutrients for brain or gut health commercially available. Studies have found that prebiotics, such as omega-3 fatty acids

and oligosaccharides, change the gut microbiota, improving the GBA function and symptoms of mental illness subjects.¹⁸ Research in humans indicates that DHA, eicosapentaenoic acid, and total omega-3 polyunsaturated fatty acids are lower in people with major depression than controls.⁹ Nonetheless, prebiotic supplementation has been demonstrated to reduce stress responsiveness, anxiety, and depressive-like behavior. One of the main classes of prebiotics is dietary fiber, including inulin, FOS, GOS, and resistant starch. Administration of FOS+GOS and GOS has been shown to increase *Bifidobacterium* and reduce stress-induced corticosterone release.⁶

We have shown for the first time that the concept of microbiome-GBA is well-known among HCPs. They realize the importance of this concept in the early stages of life since they face lots of gut challenges in their daily practices, and also many mothers are seeking brain health benefits. Specific knowledge should also be considered to improve and strengthen the HCPs’ understanding of the particular role of prebiotic and probiotic in a child’s growth and development.^{19,20} The bidirectional communication between brain and gut is crucial, so it is also important to constantly remind the HCPs about this for a better social-developmental of children.

Conflict of Interest

Authors declared no conflict of interest regarding this article.

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