



EXPLORING THE IMPACT OF HONEY ON PEDIATRIC GUT MICROBIOME AND HEALTH

¹Nimisha Mishra

¹Assistant Professor,

Dept. of Rog Nidan., Gurukul Ayurveda College,

Uttarakhand Ayurveda University, Haridwar, Uttarakhand.

Work Done at: TRISUTRA Unit - IGIB CSIR, Matura Road, New Delhi.

Received on 20/04/2018 Accepted on 25/04/2018 Reviewed on 08/05/2018 Published on 15/05/2018

ABSTRACT:

During past two decades, new emerging diseases in neonates have been reported and it became serious threat in 21st century so, there is growing interest to know the pattern of newborn feeding behavior and their different health outcome. Various researches have evidences that link neonatal health, disease, brain development, physiology, immunity and allergic conditions with gut microbiome. Microbiome is a complex ecosystem of different symbiotic bacteria, colonized in sterile gut of new born after child birth. The diversity of microbiome depends upon mode of delivery, feeding pattern, diet, maturity during birth, early use of antibiotics, environmental factors etc. *Kaumarabhritya* branch of Ayurveda precisely addresses the pediatric health and diseases. Ayurveda also states about *Jatakarma* a *Samskara*(Custom) in newborns for enhancing their immunity, intellect, luster and growth, in which honey mixed with *Ghrita* and several other herbs like *lakshmana*(*Ipomea marginata*), *Vacha*(*Acorus calamus*), *Bramhi*(*Bacopa monnieri*)etc, are administered to the newborn that robust the above functions. In present paper, an attempt has been made to explore the health outcome of *Jatakarma* in pediatric population with special reference to gut microbiome and promote ancient practice as the formula food for infants as well.

Keywords: *Jatakarma*, Microbiome, Honey, Infant, Feeding pattern.

INTRODUCTION:

Feeding pattern of neonates is now known to be associated with adult health and disease. It suggests that difference in dietary exposure in early post natal life affects permanent function in adult life¹. In recent years, it has been accepted that gut microbiome plays an important role in development of child health and disease². The diversity of gut microbiome depends upon various factors and one of them is diet. The collection of complex ecosystem of different microorganisms that live in peaceful coexistence, play an important role in human health and disease is considered as microbiome³. Ayurveda precisely talks about postnatal feeding pattern. In this traditional system, *Jatakarma* a custom is advocated in newborn for enhancing their immunity, intellect, growth etc. The focus of the article is to explore the impact of *Jatakarma* on neonatal health and gut flora development.

1. Jatakarma:

The ancient practice of newborn care for enhancing their intellect, growth and immunity in which honey and *Ghrita* along with different types of herbs are administered to newborn. In *Sushrut Samhita*, *Acharya Sushrut* has described that Honey and *Ghrita* mixed with *Ananta* (*Hemidesmus indicus*) has to be licked to the newborn with the help of ring finger and after that breast feed should be given⁴. *Acharya Sushrut* has also advised three days regime for newborn before breast feed. On the very first day, honey and *Ghrita* mixed with powder of *Ananta* (*Hemidesmus indicus*) is given thrice a day, on second and third day, *Ghrita* processed with *Lakshmana* (*Ipomea-marginata*) should be administered followed by honey and *Ghrita* (unequal quantity) equal to the amount of fist (*Paanital praman*) of newborn twice daily and at last breast feed has been advised⁴.

Acharya Vagbhatt added the use of gold spoon for administration of honey and ghee to the new born⁵. In *Kashyap Samhita*, one full chapter "*lehaadhyaya*" described the newborn feeding pattern and behavior in which gold churned with honey and *Ghrita* has to be licked to the new born to improve intellect, digestion, metabolic power, strength, life span, virtuous, aphrodisiac, complexion and eliminate the evil effects of *graha*⁶. These all again advocate the importance of honey and *Ghrita* on newborn health. With reference to amount of honey and *Ghrita*, *Acharya Charak* has already said that both should not be given in equal amount because of its poisonous effect and described it under unwholesome diet⁷. In this review paper, an effort has been made to find out the thread between *Jatakarma* and gut microbiome and its impact on newborn health.

2. Gut microbiome:

Gut microbiome is the complex ecosystem of different symbiotic bacteria in intestine. During early life there are major changes in the composition of gut flora, as at the time of birth, the gut is sterile but after that bacterial colonization just starts. The development of intestinal flora or ecosystem of gut of the neonate is the "specific selection process" which is decided by multiple factors like maternal factor, environmental factors, delivery mode, feeding habits, antibiotics use, term /preterm, hospital hygiene and diet etc as shown in figure 1⁸. It has been proved that some special group of bacteria are present on specific site of human body. The study was done by using quantitative anaerobic and aerobic culture of faeces, revealed that Enterobacteria (*E. Coli*, Streptococci) are the first bacteria which colonizes predominately in intestine and the count at first day of life is between $10^{(8)}$ – $10^{(10)}$ /gm faeces, followed by bifidofilus bacterial sp.

which quickly become predominant i.e. 10^{10} and enterobacilae get decreased⁸. It is well documented that the normal development of gut microbiome is necessary for development of brain plasticity, immunity,

digestion, metabolism, vitamin synthesis, detoxification and barrier for pathogens of infants and later life as well⁹.

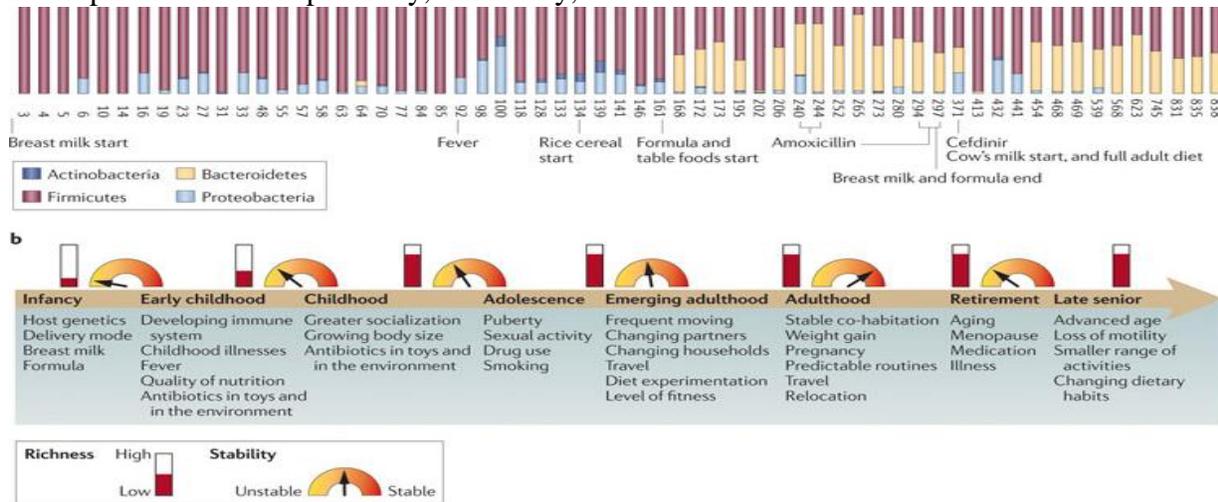


Figure 1 Development and stability of Gut flora varying from infants to elderly people.

(Picture Curtsey; Penders J et al.)

3 Contribution of honey on health:

The use of honey as food and medicine has existed both in ancient and modern science. *Acharya Charak* described that honey has best healing, scraping and *tridoshshaamak* properties. Apart from this, it is also mentioned as *Raktapittashaamak*, mild laxative and *Yogavaahi* the best carrier for medicine by enhancing bioavailability¹⁰. All these attributes of honey promotes its use in all age groups since ancient to modern era.

The composition of honey is monosaccharide (Fructose, glucose), Oligosaccharides, Disaccharides (sucrose Maltose etc.) Proteins, Aminoacids, Enzymes (Glucose oxidase, Invertase Diastrase), in addition, it also contains 12 microelements (K,Ca,Fe,Ti,etc.) Vitamins, minerals, phenol etc¹¹.

3.1 Honey as food

The high nutritional profile of honey with wide range of nutrients encourages its

use as food. Its micronutrients robust the growth and have antioxidant properties¹². Honey has high amount of fructose which has slow absorbing property due to which it maintains homeostasis and sustain energy, which suggests it as a better source for replenishment of energy during physical exercise¹³. Honey contains several enzymes which enhances digestion of carbohydrate. Beside this, it also has laxative property. Research shows that calcium absorption increases with increased honey intake¹³.

3.2 Honey as medicine-

Honey has been found to be beneficial in anemic patients. The research study showed that honey consumers have increased hematoprotective and hematopoietic properties¹⁴. Honey has potency to inhibit the activity of *Helicobacter pylori*, that causes gastritis, peptic ulcers¹⁵. Natural honey is very potent broad spectrum antibiotic, it has anti-bacterial and detoxification property because

of glucose oxidase enzyme that converts glucose into H_2O_2 ¹⁶. Honey is reported as excellent wound healer especially in fulminating and surgical wounds, as it enhances epithelization¹⁷. It is documented that honey may be used to treat various eye problems like bacterial conjunctivitis, corneal ulcers, pus discharge, eye burn¹⁸.

3. Effect Of Dietary Honey On Gut Microbiome:

Gut flora is in dynamic equilibrium that could be influenced by diet also. Various research studies revealed that honey selectively supports the growth of beneficial microflora like bifidobacteria and lactobacillus and suppresses the growth of deleterious bacterial species. This peculiarity of honey is because of its unique carbohydrate composition and complex mixture of oligosaccharides¹⁹. Fructo-oligosaccharide, the content of honey is incompletely absorbed by small intestine, fermented into colon produces lactic acid and acetic acid which promotes growth of the *Bifidofilus* species *Lact.acidophilus* and inhibit growth of *C.perfrigen*, *E.aerofacien*. This result suggests that honey may provide beneficial management of gut microflora^{20,21}.

4. Effect of honey on infant health and microbiome:

Feeding honey to newborn is a customary practice in Ayurveda. It is now established fact that feeding honey to infant will influence memory, reduced anxiety, enhanced children's performance in later life²². In 2009 Chepulis et al. has performed an experiment on animal model and concluded that early introduction of honey diet is beneficial and can improve memory and cognitive functions. Studies also showed that honey fed infant has increased hemoglobin, calcium uptake, reduced digestion problem, lighter and thinner stool, better skin color, enhanced immunity, steady

weight gain and reduced crying phase²². Apart from this honey fed infant has better colonization of Intestinal microbiota like *bifidofilus* and *lactobacilli* which are the pioneer flora of newborn intestine^{23,24}. All above results suggest that possible cause of these attribute of honey is because of *Bifidofilus* and *lactobacilli* species.

One important observation is that exclusive breast fed infants and honey consumer infants have same gut microbiome. The physiochemical properties of breast milk like low pH, Oligosaccharides, low buffering lactopherine and immunoglobulin promotes the growth of *bifidofilus* and decreases level of *enterobacteria*^{25, 26, 27} so, it can be concluded that the positive effect of honey is like human milk²⁸.

CONCLUSION:

Administration of Honey and *Ghee* in unequal quantity is recommended since ancient time. Review of all scientific researches and evidences elucidate the connection among honey, infant health and microbiome. Gut microbiome developed in honey consuming infants regulate digestion, metabolism, detoxification, brain plasticity etc, which leads to growth, development, luster, immunity and health of infants. Evidences of researches reveals that it's all positive effects are like breast milk. Apart from honey, Ayurveda also emphasizes to use the Honey with combinations of *Ghee*, *Ananta(Hemidesmus indicus)*, *Lakshamna(Ipomea marginata)* for infants feed, however benefits of these components on gut microbiome are yet to be explored. This is the need of hour to popularize and practiced this ancient custom as formula food for infants, this will be novel approach to build up a healthy generation by preventing the upcoming diseases and enhancing the strength and immunity of neonates, leading them to socially and economically productive health.

ACKNOWLEDGEMENT:

Author thankfully acknowledges Ayurgenomics Team of CSIR (Dr.Mitali Mukherjee, Dr. Bhavana Prasher, Dr. Bharat, Dr.Sridevi Unni) and the suggestions given by Dr. Jyoti Rana and Dr.Nitish Ojha during preparation of the paper.

REFERENCES:

1. Robinson S, Fall C. Infant nutrition and later health: a review of current evidence. *Nutrients* 2012; 4:859–874.
2. Ducluzeau R. Development, equilibrium and role of microbial flora in the newborn. *Ann Pediatr (Paris)* 1993; 40:13–22.
3. Huttenhower, Curtis et al. “Structure, Function and Diversity of the Healthy Human Microbiome.” *Nature* 486.7402 (2012):207–214
4. Kaviraj Dr.Ambika Dutt Shastri, Sushruta samhita sharirsthana, Chaukhambha bhartiya academy, Varanasi(2009).
5. Brahmanand Tripathi. Astanga Hridayam of Srimad vagbhata, edited with ‘Nirmala’ Hindi Commentary, Delhi: Chaukhamba Sanskrit Pratishthan, Reprint edition 2009
6. P.V.Tiwari.Vrihadjivakiya Tantra .Chukhambha Vishvabharti Varanasi first edition 1996.
7. Ram karan Sharma and Bhagwan Das. Charak Samhita Sutrasthan Ch26th, Chaukhambha Sanskrit Series Office ,Seventh edition 2001.
8. Penders J, C Thijs, C Vink, FF Stelma, B Snijders . Factors Influencing the Composition of the Intestinal Microbiota In Early Infancy. *Pediatrics*. August 2006;118:2 511-521.
9. Douglas M, Escobar, E Elliott. Effect of Intestinal Microbial Ecology On the Developing Brain Intestinal Microbial Ecology and Developing Brain. *JAMA Pediatrics*,. 2013 Apr;167(4):374-9.
10. Ram karan Sharma and Bhagwan Das. Charak Samhita Sutrasthan Ch27th, Chaukhambha Sanskrit Series Office ,Seventh edition 2001.
11. Ajibola A, Chamunorwa A. Nutraceutical Values of Natural Honey and Its Contribution to Human Health and Wealth. *Nutrition*. 2012 Jun 20; 9:61.
12. Bogdanov S, Jurendic T, SieberR, Gallmann P. Honey for Nutrition and health: A Review. *Journal of College Nutricia* 2008, 27(6):677–689.
13. Ariefdjohan MW, Martin BR, Lachcik PJ, Weaver CM. Acute And Chronic Affects Of Honey And Its Carbohydrate Constituents On Calcium Absorption In Rats. *Journal of Agriculture Food Chemistry*, 2008, 56:2649–2654.
14. Schramm DD, Karim M, Schrader HR, Holt RR, Cardetti M, Keen CL. Honey with High Levels Of Antioxidants Can Provide Protection To Healthy human Subjects. *Journal of Agricultural Food Chemistry* 2003, 51:1732–1735.
15. Ali ATMM. Natural Honey Accelerates Healing of Indomethacin Induced Internal Ulcers in Rats. *Saudi Medical Journal* 1995, 16:161–166.
16. Molan PC, Variation in The Potency of the Antibacterial Activity. *Bee World* 1992, 73:59–75.
17. Bergman A, Yanai J, Weiss J, Bell D, David P. Acceleration of Wound Healing by Topical Application of Honey, An Animal Model. *Am J Surg* 1983, 145:374–376.
18. Mozherenkov VP: Prokofeva. Honey Treatment of Post Herpetic Opacities of the Cornea. *Oftalmol Zhu* 1984, 3:188 (In Russian).
19. AME El-Arab, SM Girgis, EM Hegazy. Effect of Dietary Honey On Intestinal Microflora and Toxicity of

- Mycotoxins in Mice - BMC Complementary 2006 Mar 14; 6:6.
20. Han-Seung Shin, Zeynep Ustunol . Carbohydrate Composition of Honey from Different Floral Sources and Their Influence On Growth Of Selected Intestinal Bacteria: An In Vitro Comparison. Michigan State University, Department of Food Science and Human Nutrition, 48824-1224, USA January 2005.
 21. Shamala1 R, Y. Shri Jyothi1 and P. Saibaba. Stimulatory Effect of Honey On Multiplication of Lactic Acid Bacteria Under In vitro And In Vivo Conditions. Letters of Applied Microbiology. 2000 Jun;30(6):453-5.
 22. Chepulis LM, Starkey NJ, Waas JR, Molan PC: The Effects of Long-Term Honey, Sucrose or Sugar-Free Diets On Memory and Anxiety in Rats. Physiology Behavior 2009, 97:359–368.
 23. Ramenghi LA, Amerio G, Sabatino G. Honey, A Palatable Substance for Infants: From De Rerum Natura to Evidence-Based Medicine European Journal of Pediatrics. 2001, 160:677–6.
 24. Bianchi EM. Honey: It's Importance in Children's Nutrition. Amer Bee Journal 1977, 117:733.
 25. Yoshioka H, Iseki K, Fujita K. Development and Differences of Intestinal Flora In The Neonatal Period In Breast-Fed And Bottle-Fed Infants. Pediatrics. 1983 Sep; 72(3):317-21.
 26. Balmer SE, Wharton BA. Diet and Faecal Flora in the Newborn: Breast Milk and Infant Formula. Arch Dis Child. 1989 Dec; 64(12):1672-7.
 27. Harmsen HJ¹, Wildeboer-Veloo AC, Raangs GC, Wagendorp AA, Klijn N, Bindels JG, Welling GW. Analysis of Intestinal Flora Development in Breast-Fed and Formula-Fed Infants By Using Molecular Identification And Detection Methods. Journal of Pedia-gastroenterol Nutricia 30: 61–67.
 28. Langhendries JP¹, Paquay T, Hannon M, Darimont J. Intestinal Flora in The Neonate: Impact On Morbidity and Therapeutic Perspectives. Archival of Pediatrics. 1998 Jun; 5(6):644-53.

CORRESPONDING ADDRESS

Dr. Nimisha Mishra
Assistant Professor
Department of Rog Nidan
Gurukul Ayurveda College,
Uttarakhand Ayurveda University
Haridwar, Uttarakhand.
Email.id

Source of support: Nil
Conflict of interest: None Declared