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Breast milk as an etiological factor in infantile disorders – An observational study

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ABSTRACT

Background: Charaka, Sushruta, and Kashyap Samhita mentions Stanya as Upa dhatu of Rasa and described the importance of Stanya (breast milk) as primary diet for growth and development of infants. As per Ayurveda Samhitas, dushita stanya (vitiated breast milk) is responsible for various morbidities.

Objective: Validation of organoleptic methods to find out breast milk vitiation and to verify doshas in breast milk as an etiological factor in infantile disorders.

Materials and methods: Hundred breast milk samples were collected from lactating mothers feeding their babies only breast milk, with babies' in the age group of 1–6 months. Each sample was examined by organoleptic methods (Avaseedati, Tantuvut, Rajyoambhasi, Picchilam, Ghanam, Dravam, etc.) and laboratory investigations (pH, specific gravity, viscosity, and fat content).

Result: All breast milk samples were found to have varying dosha vitiated characters. Amongst them Tridosha Dushti and characters like Avaseedati, Plavate, and Rajyoambhasi were found more frequently. Among the infants, 19% did not have any type of dosha vitiation symptoms and 81% presented with various symptoms. Similarity in dosha between the symptoms of infants and vitiation of their mother's breast milk existed in 26% and 55% showed dissimilarity in doshas.

Conclusion: The physical characteristics of the milk may be influenced by several factors like food habit, psychological status, nutritional status of mother, period of lactation and at least in 26% of cases of infantile disorders, vitiation of milk was found with symptoms in infants showing similar dosha vitiation characters.

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1. Introduction

Ayurveda advocates the advantages of Stanya (mother's or wet nurse's milk) over other feeding options to newborns. Ayurveda considers mother's milk as 'Piyush' or Amrut (nectar) [1]. Kashyap Samhita states that pure breast milk gives unimpeded strength, longevity, growth, and development to child and also to the mother or wet nurse [2]. Modern science has described composition of various types of animal milk and has proved that mother's milk is suitable for the newborn as it is digestible and also contains adequate nutrients. Also, there are no suitable feeding alternatives for the well-being of infants.

Ayurveda classics have emphasized on the aspect of abnormalities of breast milk and their consequences on infants and as well as on mothers. In this pursuit, Ayurveda has a unique theory on milk vitiation which explains non-suitability of breast milk for infants [3]. The theory also describes signs of vitiated milk and its adverse effects on the infant. This concept too is in accordance with Ayurveda's theory of three patho-physiological humors or doshas viz., Vata, Pitta, and Kapha. These doshas are regulators of homeostasis if maintained in balanced state by means of appropriate diet and deeds. Mother's indulgence in inappropriate diet and in unusual practices can vitiate doshas and the imbalanced state of doshas in turn can vitiate breast milk [3,4,5]. The vitiated breast milk also affects mother's health by causing diseases like jwara [2]. Ayurveda also describes the change in quality of breast milk and the adverse effects of vitiated milk on the infant [6]. According to Charaka Samhita, the milk which is normal in color, smell, taste, and touch, dissolves completely in water and is wholesome to infant

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Table 1
Qualities of pure breast milk.

Color	Taste	Smell	Temperature	Appearance	Consistency	Jala Pariksha	Effects	Reference
Natural	Natural	Natural	Natural	Natural	Natural	Dissolves uniformly	It is wholesome and unctuous, provides longevity and nourishment	C.Sha. 8/54
White like conch shell	Sweet	—	Cold	Normal	Thin	Dissolves uniformly	Provides good health, growth, and development of body as well as gives strength to the infant	S.S.Sha.10/33
Acharya Vagbhata has not mentioned about the qualities of pure breast milk; however, he described the breast milk devoid of properties of vitiated breast milk as pure milk.							Provides good health, adequate growth and strength	A.S.U. 1/21
Acharya Kashyapa has described, the breast milk which is wholesome both to mother and child as pure milk.							Unimpeded development of strength, growth and development in disease free state	K.S.S. 19/26

and can be considered as normal breast milk [7]. Different *Acharyas* have mentioned qualities of pure breast milk and their effect on infants (Table 1.)

Ayurveda *Samhitas* discuss that milk vitiation occurs either by vitiated *dosha* or by combination of *doshas*. Vitiated milk is devoid of normal characters like taste, smell, color, temperature, consistency, foam, viscosity, etc. [8]. Hence, the proper observation of these characters by a clinician is of prime importance. Also, appropriate treatment and management of the diseased child can be possible if the vitiation is properly linked with the responsible *dosha*.

Acharya Kashyapa while describing the characteristics of pure breast milk has also mentioned ‘non-ailing to the infant’ as one of the essential features, which means vitiated milk is capable of producing diseases in the newborn. *Acharya* further adds, the *Maharogas* can also occur due to the consumption of the vitiated milk [2]. *Acharya Charaka* described that the vitiated milk is responsible to produce symptoms depending upon the involved *dosha* [3]. *Maharshi Sushruta* has explained that the vitiated milk produces physical diseases in the infant [9]. *Madhav Nidana* has mentioned that vitiated milk is accountable for a variety of disorders in the infant [6].

Apart from this generalized implication, ancient texts narrate specific symptoms and disorders resulting from vitiated milk. *Kashyapa* has mentioned breast milk induced marasmus and

conjunctivitis [2], *Vagbhata* has mentioned breast milk induced diarrhea [10] manifested due to vitiated breast milk in infants. Table 2 depicts the diseases produced by vitiated *doshas*.

Hence, the present study was undertaken to validate an organoleptic method of examination of *Stanya* for finding *doshas* as described in Ayurvedic classics and to verify *doshas* in *Stanya* as an etiological factor in infantile disorders.

2. Materials and methods

2.1. Source of data

Lactating mothers (aged 20–30 years) and their babies attending the OPD and IPD of SDM College of Ayurveda & Hospital Hassan, Karnataka were registered for this study with their consent.

2.2. Methods of collection of samples

Breast milk samples were collected in a sterile bottle by mother with or without assistance of mother's attendant or nursing staff by hand expression. Breast pumps were not used to express the milk to avoid any contamination; also it may alter the characters of the milk. Minimum 10 ml of breast milk was collected which was sufficient for all investigations. Infants were suckled for 5 min before the hand expression to maintain uniformity in the constituents of breast milk and also for easy expression of the milk.

2.3. Inclusion criteria

Mothers having infants in the age group of 1–6 months irrespective of the health condition of the infants.

2.4. Exclusion criteria

1. Infants having the history of pre- and post-mature delivery, birth asphyxia, and intra-uterine infections.

Table 3
Dosha vitiation signs of breast milk in relation to diet of mothers.

<i>Dosha</i>	Diet		Total
	Vegetarian	Mixed	
<i>Vata</i>	1	1	2
<i>Pitta</i>	—	—	—
<i>Kapha</i>	1	2	3
<i>Vata-Pitta</i>	3	4	7
<i>Vata-Kapha</i>	9	10	19
<i>Pitta-Kapha</i>	5	6	11
<i>Tri-doshaja</i>	29	29	58

Table 2
Diseases produced by vitiated *doshas*.

Dushti	Disease	Verses
<i>Vataja</i>	<i>Karshyata</i> (Emaciation) <i>Charmadala</i> (Dermatitis)	C.S.Chi. 30/234–247 K.S.Khi.15/7
<i>Pittaja</i>	<i>Pandu</i> (Anemia), <i>Kamala</i> (Jaundice), <i>Atisara</i> (Diarrhoea) <i>Charmadala</i> , <i>Amlapitta</i> (Hyperacidity), <i>Vamana</i> (Vomiting), <i>Kasa</i> (Cough), <i>Swasa</i> (Dyspnea), <i>Jwara</i> (Fever)	C.S.Chi. 30/234–247 K.S.Khi.15/8
<i>Kaphaja</i>	<i>Phakka</i> (Breast milk induced marasmus) <i>Balashosha</i> (Emaciation) <i>Charmadala</i> <i>Visarpa</i> (Erysipelas), <i>Kota</i> (Erythematous rash), <i>Kandu</i> (Itching), <i>Swasa</i> (Dyspnea), <i>Kasa</i> (Cough), <i>Shaitilya</i> (Cold body), <i>Pratishyaya</i> (Coryza), <i>Kshiralasaka</i> <i>Pangu</i> (Lame), <i>Jada</i> (Idiot), <i>Mooka</i> (Dumb)	A.S. U 2/14 K.S.Chi.17/4 A.H. U 8/19 K.S.Khi.15/9 A.S.U.2/16
<i>Tri-doshaja</i>	<i>Kukunaka</i> (Conjunctivitis) <i>Kshiralasaka</i> (Breast milk induced diarrhea) <i>Charmadala</i>	K.S.Chi.17/5 S.S.U 19/9, K.S. Khi.13/7–8 A. S.U 2/20–22 K.S.Khi.15/10
No specific <i>dosha</i>	<i>Ahiputona</i> (Diaper rash) <i>Utpullika</i> (Pneumonia) <i>Visarpa</i>	S.S. Ni. 13/52, A.H.U 2/81 H.S 3.54.9–13 K.S.Khi 14/10–15

Table 4Characters of vitiated breast milk as per vitiated *dosha*.

Vata	n	Pitta	n	Kapha	n
<i>Varna</i> (Colour)					
<i>Aruna varna</i> (red)	00	<i>Neela varna</i> (blue)	08	<i>Atyarthashuklam</i> (white)	06
<i>Shyava varna</i> (bluish black)	00	<i>Tamra varna</i> (copper color)	00		
		<i>Krishna varna</i> (black)	00		
<i>Rasa</i> (Taste)					
<i>Kshayanurasa</i> (astringent as second taste)	00	<i>Tiktanurasa</i> (bitter as second taste)	00	<i>Atimadhuram</i> (excessive sweet)	00
		<i>Katuanurasa</i> (pungent as second taste)	00	<i>Lavananurasa</i> (salty as second taste)	00
		<i>Amlaanurasa</i> (sour as second taste)	00		
<i>Gandha</i> (Smell)					
		<i>Rudhiragandhi</i> (bloody smell)	02	<i>Chritagandhi</i> (ghee smell)	10
		<i>Kunapgandhi</i> (stinking)	02	<i>Tailagandhi</i> (oily smell)	02
				<i>Vasa gandhi</i> (fatty smell)	00
<i>Jala Pareeksha</i> and others					
<i>Vishada</i> (cleanliness)	00	<i>Rajiyoambhasi</i> (yellow line formation)	63	<i>Ghanam</i> (thickness)	21
<i>Dravam</i> (thinness)	19			<i>Picchilam</i> (sliminess)	02
<i>Phenilam</i> (frothy)	06			<i>Bahal</i> (heaviness)	02
<i>Plavate</i> (floating)	72			<i>Tantuvat</i> (thread like)	17
				<i>Avaseedati</i> (settling down)	94

Note: Any positive evidence of one or more characters from each group is taken as positive evidence.

n: Characters observed in number of breast milk samples.

- Infants with congenital abnormalities, inborn abnormalities of metabolism or specific infections like tuberculosis, etc.
- Mothers suffering from chronic systemic diseases (HIV, TB, etc.) and postnatal complications like breast abscess, etc.

2.5. Assessment criteria

- Organoleptic characters of milk were studied within an hour of sample collection for the assessment of qualities like taste, smell, and color, etc. These were assessed by a team of post graduates scholars of *Kaumarbhritya*. Taste was assessed by tasting a few drops of milk. The smell was assessed by team members by smelling the bottle containing the milk sample.
- Picchilam* (sliminess) [3,8,13] was assessed by putting a drop of milk on glass slide and its consistency was examined with needle. Thread or sticky appearance was considered as positive. Qualities like *Ghanam* (thickness) [11–13] and *Dravam* (thinness) [8] were assessed by putting a drop of milk on a white blotting paper, immediately spread up to 2 cm diameter was considered as normal, more than 2 cm was considered as *dravam* and spread of less than 2 cm was considered as *ghanam*.
- The method of examination of breast milk by *Jala Pareeksha* by *Acharyas* is obscure, the information about the containers used (metal or mud), the size of the drop of milk and height at which it used to be dropped are obscure. Hence, to validate the method in the present study, we tried with different heights with the same size of the drop and observed that increase in the height lead to more dispersion. Based on this observation to maintain the uniformity, 5 cm height was fixed from the surface of water. A clear glass vessel was used and observed from horizontal view. Hence, the variations in the method developed in the present

study and observations explained by *Acharyas* may interfere with the observations.

Jala Pareeksha was performed in a transparent glass container filled with clean tap water. A drop of milk was dropped from fixed distance using a dropper and characters like settling down [8,14], formation of thread-like structure [8], and formation of yellow lines were observed [14].

Laboratory examinations viz., pH, specific gravity, viscosity, fat contents, and culture and sensitivity tests were carried out referring to the standard methods [15–18].

Foam test was carried out to assess the foam [8]. As per the best of authors knowledge, there were no earlier reports found on foam test of breast milk; hence, the method adopted was as follows: 5 ml of the milk sample was taken in a 15 mL test tube and air pressure was introduced in the bottom by immersing a custom made device consisting of spinal needle (16 G, 1.6 mm White) connected to an aquarium air compressor. A medium air pressure was given for 30 s and observed, if foam rises above 85% (approximately above 12.5–13 cm) and persisted for 30 s even after removing air pressure was considered to be positive.

Growth and development of the infant was assessed as per the anthropometric measurements [19]. A record of conditions manifesting in the infant from the specific vitiated *Stanya* were compiled from *Samhitas* and were assessed in infants [3,2,8,20,21]. Detailed history and examination of mother was conducted to rule out any disorder similar to those seen in infants and breast milk.

3. Results and discussion

Total 100 breast milk samples from lactating mothers between the age range of 20 to 30 years and their babies between 1 to 6

Table 5Vitiation of *dosha* in breast milk and symptoms in infants.

Eka-doshaja				Dwi-doshaja				Tri-doshaja				No Dushti			
	Stanya	Infants	M:F ^a		Stanya	Infants	M:F ^a		Stanya	Infants	M:F ^a		Stanya	Infants	M:F ^a
<i>Vata</i>	02	11	3:8	<i>Vata-Pittaja</i>	03	01	1:0	58	24	13:11	00	19	9:10		
<i>Pitta</i>	00	04	1:3	<i>Vata-Kaphaja</i>	21	20	13:7								
<i>Kapha</i>	03	15	6:9	<i>Pitta-Kaphaja</i>	13	06	4:2								
Total	05	30	10:20		37	27	18:9								

^a Number of infants are presented in male and female ratio.

Table 6
Symptoms of *dosha* vitiation in infants.

Vata	n	Pitta	N	Kapha	N
Balahrass (reduced strength)	04	Vivarnagatram (body discolorisation)	01	Kunthana (straining)	02
Vatika shiroroga (headache due to vata)	00	Ushna shariri (hyperthermia)	18	Shuna vakrakshi (swollen eyes)	00
Nachasyaswadate kshira (breast milk with bad taste)	05	Kamala (jaundice)	00	Tamakanvita (asthma)	01
Kshamaswara (low pitched voice)	04	Nabhinandati Stanam (dislikes breast feed)	05	Hridroga (heart diseases)	00
Badhavinmutrata (obstruction of fecus, urine & flatus)	06	Trishnalu (excessive thirst)	03	Klama (exhaustion)	00
Pinasa (coryza)	26	Swinna (perspiration)	01	Praseka (excessive salivation)	02
Gatraspurata (involuntary movements of body parts)	06	Pandvamaya (paleness)	01	Lalalu (excessive dribbling of saliva)	07
Admana (distended abdomen)	17	Bhinnavit (loose stool)	10	Swasa (dyspnoea)	00
				Chardi (vomitting)	15
				Kasa (cough)	33
				Nidra (sleep)	13

n: number of infants possessing the symptoms.

months of either sex who were exclusively fed upon the breast milk were studied. Babies aged below 1 month were not considered for the study because during initial days of post-partum period, breast milk i.e., colostrum contains high level of proteins, fats, immunoglobulins, etc. which may alter the physical characters of the milk. Also, after a month, lactation is well-established in mothers.

Breast milk is the product of the physiology of mother's body. Its quality and quantity depends on the precursors in the mother's body and on general physical and psychological state of mother and the diet. The percentage of lactating mothers taking vegetarian and mixed diet with signs of vitiated breast milk were 48% and 52% respectively (Table 3.). This may be because, along with *Ahara* other factors like *Vihara*, *Desha*, *Kala*, *Bala*, etc. were considered to be responsible.

Samhitas have mentioned 27 characters of vitiated breast milk (Table 4.). Out of 27, only 15 characters were distinguished; however, due to practical difficulty, 12 characters were not distinguished, as these characters were subjective in nature and varied from individual to individual. Characters like colour, taste, and smell were difficult to appreciate in individual samples without comparing them with the standard parameters. Among the observed characters, 72% of samples showed *Vata* vitiation character, 63% showed *Pitta* vitiation character, and 94% of samples showed *Kapha* vitiation character. This difference in the characters may be due to specific nature of the breast milk of the mother influenced by *ahara*, *vihara*, *desha*, and *kala*. In the present study, the breast milk samples showed, 58% *Tri-doshaja*, 37% *Dwi-doshaja*, and only 5% were showing *Eka-doshaja* signs of vitiation of breast milk (Table 3.).

The present study clearly demonstrates that 81% of infants presented varying *dosha* vitiation symptoms and only 19% of infants did not show any of the *dosha* vitiation symptoms due to

good immunity and hence, no symptoms were exhibited (Table 3.). Maximum number of infants were from the age group of 1–2 months (32%). Of the total infants, 27% were from 2 to 3 months age group and only 1% was from the age group of 5–6 months. In 1–2 months age group, 84% of the infants presented the symptoms of *dosha* vitiation while 16% did not exhibit any such symptoms. This may be due to the fact that in early age, the immunity, maturation of gastrointestinal tract and its tolerance capacity is very minimal. However, with age progression, the *dosha* vitiation symptoms in infants reduced. Table 5 shows vitiation of *dosha* in breast milk and symptoms with respect to sex of infants.

The signs and symptoms of vitiated milk observed in the infants were compiled from *Samhitas* (Table 6). Amongst these symptoms headache due to *vata*, swollen eyes, jaundice, heart disease, exhaustion, and dyspnea were not observed. There is a possibility that these symptoms were rare to occur or else difficult to identify in infants by clinician as well as the mother. The symptoms like cough and coryza were observed frequently and were easily observed by parents.

The relation between milk vitiation and infants' symptoms are presented in Table 7. Amongst all the samples, 26% of infants were having similar *dosha* vitiation symptoms as that of the breast milk vitiation and 19% of infants didn't had any symptoms even though the breast milk had shown vitiated characters. Remaining 55% of infant's *dosha* vitiation symptoms were not relating with the *dosha* of breast milk.

Physical properties were investigated in 100 breast samples (Table 8.) and the results revealed wide range of values of pH (6.1–7.5), specific gravity (1.002–1.040), viscosity (1.078–2.344 cP), and fat content (2.1–5.1%). Foam test was performed to assess the *Phenilatva* which is the character of *Vata* vitiated breast milk. Among 100 samples, only 6 were positive to foam test. Unit values of physical properties vary irrespective of type of breast milk vitiation. This observation indicates possible physiological disturbances in mother have their effect on characteristics of milk. The results of foam, culture, and sensitivity test are presented in Table 9.

Table 7
Relation between milk vitiation and infants' symptoms.

Stanya Dusti	Infants symptoms										
	No Dushti	Similarity	Dissimilarity								Total
			V	P	K	VK	VP	PK	VPK		
Vataja	00	00	00	00	00	00	00	00	02	02	
Pittaja	00	00	00	00	00	00	00	00	00	00	
Kaphaja	00	01	00	01	00	00	00	00	01	03	
Vata-Kaphaja	06	06	01	01	03	00	00	01	03	21	
Vata-Pittaja	00	00	00	00	00	02	00	01	00	03	
Pitta-Kaphaja	03	03	00	00	02	02	01	00	02	13	
Tri-doshaja	10	16	10	02	09	10	00	01	00	58	
Total	19	26	11	04	14	14	01	03	08	100	

V: Vata; P: Pitta; K: Kapha.

Table 8
Physical properties of breast milk.

Sl. No	Test	No. Of samples	Minimum value	Mean value	Maximum value
1	pH	100	6.1	6.8	7.5
2	Specific gravity	100	1.002	1.030	1.040
3	Viscosity (Relative) (Centi poise)	100	1.07	1.73	2.34
4	Fat (%)	100	2.1	3.8	5.1

Table 9
Foam, culture and sensitivity test.

Sl. No	Test	No. samples	Positive	Negative
1	Foam test	100	06	94
2	Culture and sensitivity	15	00	15

4. Conclusion

Breast milk is the main diet of infants. Consumption of vitiated breast milk may cause various disorders along with inadequate growth and development of the child. Thus, it is necessary to provide pure milk to the child. Ancient scholars have stressed very much on this aspect and have given a detailed account of abnormalities of breast milk and their consequences. Such emphasis has not been given by modern science. To the best of the authors' knowledge, the study is a first of its kind and hence, has limitations pertaining to the validation of the studied parameters.

The organoleptic method of examination of breast milk may have differences in perception. It is difficult to distinguish the characters like smell, taste, and colour as these are subjective parameters. Laboratory investigations were insufficient to draw conclusions. Hence, further studies are needed to evaluate the nutrient composition and culture sensitivity studies to assess the presence of specific micro-organisms. From the obtained results, it is difficult to establish the relationship between milk vitiation and infants' symptoms due to role of infants' immunity and hence, all infants consuming vitiated milk have not suffered from diseases. The present study revealed a wide gap between the minimum and maximum values of pH, specific gravity, fat, and viscosity as breast milk is a composite mixture of proteins, vitamins, lactose, minerals, fat globules, and other minor constituents.

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Conflict of interest

None.

Author contributions

RM has contributed in conceptualization, resources, methodology, investigation, writing original draft and visualization. GA has contributed in methodology, investigation, writing - review and editing.

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