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.
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 Stunya for finding doshas as described in Ayurvedic classics and to verify doshas in Stunya 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 2

| Dushta | Disease | Verses |
|--------|---------|--------|
| Vataja | Karshyata (Emaciation) | C.S.Ch. 30/234-247 |
|        | Charmadala (Dermatitis) | K.S.Khi.15/7 |
| Pittaja | Pudu (Anemia), Komala (Jaundice), Atisara (Diarrhoea) | C.S.Ch. 30/234-247 |
|        | Charmadala, Amlapitta (Hyperacidity), Vamana (Vomiting), Kasa (Cough), Swasa (Dyspnea), Juva (Fever) | K.S.Khi.15/8 |
| Kaphaja | Phakka (Breast milk induced marasmus) | A.S.U 2/14 |
|        | Balashosha (Emaciation) | K.S.Khi.17/4 |
|        | Charmadala | A.H. U 8/19 |
|        | Visarpa (Erysipelas), Kata (Erythematous rash), Kanda (itching), Swasa (Dyspnea), Kasa (Cough), Shaititiya (Cold body), Pratishyaya (Coryza), Kshirasaka | A.S.U.2/16 |
| Tri-dosha | Pangu (Lame), Jada (Idiot), Mooku (Dumb) | K.S.Ch.17/5 |
|        | Kukanaka (Conjunctivitis) | K.S.Khi 19/9, K.S. Khi.13/7-8 |
|        | Kshirasaka (Breast milk induced diarrhea) | A.S. JU 2/20-22 |
|        | Charmadala | K.S.Khi.15/10 |
| No specific dosha | Ahipatona (Diaper rash) | S.S. Ni. 13/52, A.H.U 2/81 |
|        | Utpulika (Pneumonia) | H.S 3.549–13 |
|        | Visarpa | K.S.Khi 14/10-15 |

| Dushta | Diet | Vegetarian | Mixed | Total |
|--------|------|------------|--------|-------|
| Vata   | 1    | 2          |        |       |
| Pitta  | –    | –          |        |       |
| Kapha  | 1    | 2          | 3      |       |
| Vata-Pitta | 3     | 4          | 7      |       |
| Vata-Kapha | 9       | 10         | 19     |       |
| Pitta-Kapha | 5       | 6          | 11     |       |
| Tri-dosha | 29      | 29         | 58     |       |
2. Infants with congenital abnormalities, inborn abnormalities of metabolism or specific infections like tuberculosis, etc.
3. Mothers suffering from chronic systemic diseases (HIV, TB, etc.) and postnatal complications like breast abscess, etc.

2.5. Assessment criteria

1. 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 KaumARBhritiya. 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.

2. 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.

3. 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 Stanyu 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
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 factors like Vihara, and Kapha dosha

| Physical properties of breast milk. |
|-------------------------------------|
| 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) | 100 | 1.07 | 1.73 | 2.34 |
| 4 | Fat (%) | 100 | 2.1 | 3.8 | 5.1 |

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 6 |
|---|
| Symptoms of dosha vitiation in infants. |
| | n | Pitta N | Kapha N |
|---|---|---|---|
| Balahrasa (reduced strength) | 04 | Vivaragatram (body discolorisation) | 01 | Kunhana (straining) | 02 |
| Vatika shirorga (headache due to vata) | 00 | Ushna shariri (hyperthermia) | 18 | Shuna vrukshiki (swollen eyes) | 00 |
| Nachyaswaswade kshira (breast milk with bad taste) | 05 | Kamala (jaundice) | 00 | Tamakarnavita (asthma) | 01 |
| Kshamamwara (low pitched voice) | 04 | Nabhinanadati Stannam (dislikes breast feed) | 05 | Hridroga (heart diseases) | 00 |
| Badhavininimutra (obstruction of fecus, urine & flatus) | 06 | Trekhmalu (excessive thirst) | 03 | Kamla (exhaustion) | 00 |
| Pisana (coryza) | 26 | Swinma (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 | Bhinnavat (loose stool) | 10 | Swasa (dyspnoea) | 00 |
| | | | | Chardi (vomitting) | 15 |
| | | | | Kosa (cough) | 33 |
| | | | | Nidra (sleep) | 13 |

n: number of infants possessing the symptoms.
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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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.