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Evaluation of the physiological and pathological status of Stanya (Breast milk) based on the Ayurveda principles and Physico-chemical analysis- A Cross-sectional study

Research Article

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Abstract

Background: In Ayurveda, *Stanya Dosha* was described by almost all Acharya stating the *Dushti* of breast milk which is not accepted by modern sciences as they perceived that breast milk is exclusively advised to all neonates and there is no such description to examine the abnormality of breast milk. As Ayurveda literature is *Shaswat* (eternal) which gives us a reason for the need to provide evidence or scientific explanation to support our literature. To make the world aware of *Stanya Dushti*, scientific evidences must be provided for other scientific systems to embrace the notion. Aim: To assess the quality of *Stanya* by examining its features as told in Ayurveda literature and its physicochemical properties. Objectives: To establish assessment criteria to assess *Stanya Dushti* through basic sciences. To assess the *Stanya* by observing the organoleptic property. Experiment with its physicochemical properties of protein estimation, viscosity, pH, value, and density. To assess the *Dosha* of breast milk by *Jala pariksha*(Dispersion method). Materials and methods: Observational study on breast milk of 60 lactating mothers collected from mothers coming for vaccination & OPD of MGACH&RC, PHC Salod, Wardha. Observation: 38.3% were *Shuddha* and 61.7% were *Ashuddha* with 11.7%*Vatapitta*, 25% *Kaphapitta*, 11.7%*Vata*, 5% *Pitta,*and 8.3% *Kapha*dominance. Mean values of pH, viscosity, density, and protein were found as 6.91, 1.64 cP, 1.02 gm/cc, and 1.72% respectively. Result: The breast milk of *Shuddha stanya* part was 38.3% and that of *Dushti* was 61%. The dominance of *Dosha* shows highly significance with *Prakriti*. The infants with *Stanya Dushti* show significant risks of developing clinical symptoms of GIT and the respiratory system.

Keywords: *Shuddha, Stanya Dushti, Stanya Pareeksha,* Breast milk, Ayurveda, Physicochemical analysis.

Introduction

Different Acharya described the *Dushti* (impure) of *Stanya* (breast milk) and its causes, characteristics, types, varieties of treatment, etc. Acharya Sushruta has described the formation of *Stanya* (breast milk) as '*Rasaprasaado Madhuraha Pakvaharanimittajaha. Krsnadehat Stanau Praptaha Stanyamisya bhidhiyate*' (1) means the food which is taken by the mother is converted into *Rasa* after its digestion. This *Rasa* (essence) circulates throughout the body reaches *Stana* (breast) and is called *Stanya* (breast milk). According to Susruta, *Stanya* is the *Upadhatu* (subsidiary tissue) of *Rasa Dhatu* (plasma/lymph fluid). In Astanga Hrdaya, the newborn baby is advised to take breast milk only, as it is *Sampat* i.e., homogenous and suitable for the growth and development of the baby. Acharya Kashyapa mentions that before the pregnancy the *Dhamani* (arteries) which supplies the breast gets completely constricted and as a result, the vitiated *Dosha* (humour) cannot reach the breast hence there is less incidence of any breast disorder (2). Breast milk, a unique and essential source of nutrition for infants, undergoes numerous biochemical changes to support a newborn's growth and development. Understanding the composition of breast milk is crucial for assessing its quality and suitability for the infant's needs. In Ayurveda, Acharya described *Shuddha* (pure) and *Stanya Dushti* (vitiated breast milk). As Ayurveda is *Shashwat* (eternal), a deep understanding of the concept told by Acharya, what we see in practice and our day-to-day life nowadays is to be validated. Awareness and publication of *Stanya Dushti* are essential for promoting breastfeeding health and addressing the potential issues that may arise. Understanding the literature of its true meaning and how to decide and examine the *Dushti* (vitiated) is needed. There are nine *Bahirmukha Srotas* (external apertures) in both males and females and an extra three are present in females i.e., two in *Stana* (breast) and one *Garbhashaya Mukha* (genitalia) (3). The amount of *Stanya* is 2 *Anjali* (4). The *stanya* which is not in the state of *Dushta* have the characteristic - *Prakrita Varna-Shankhavabhasa* (normal colour) and *Pandura* (pale white), *Prakrita Rasa* (normal taste)- *Madhura* (sweet), *Kashaya Anurasa* (astringent after taste), *Prakrita Gandha* (normal smell)- *Madhura*

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Gandha, Prakrita Sparsha (normal temperature)-*Himavat,* form a homogenous mixture of water, *Pushtikara* (nutritious), *Arogyakara* (maintain health) (table 1)(5).The benefits of consuming *Shuddha Stanya* are *Jeevaniya* (life promoting), *Brumhaniya* (nourished), *Sathmya* (accustomed), *Snehana* (provides oily substance), Treats *Raktapitta* (bleeding disorders), Treats eye disorders (6). The type of *Stanya Dushti* according to different Acharya is listed in Table 2.

Table 1: *Stanya Pareeksha* (Examination of breast milk)

Dosha	**According to Charaka (7)**	**According to Susruta (8)**
Shuddha	*Prakrita Varna*(normal colour) *Prakrita Gandha*(normal smell) *Prakrita Rasa*(normal taste) *Prakrita Sparsha* (normal touch) On mixing with water: it forms a homogeneous mixture	*Shankhavabhasa, panduram* (pale white) *Madhura* (sweet) *Shitala* (cold in nature) *Amalam* (spotless) On mixing with water: it is *Aphenilam* (not frothy), *Atantumat* (not sticky), *Aplavan* (not floating), *Avasadi* (not too immersed)
Vata	*Syava Aruna Varna*(blackish lustre), *Kashaya Anurasa*(astringent aftertaste), *Analakshya Gandha*(no smell), *Phenila*(frothy), *Laghu*(light), *Ruksha*(dry)	*Kashaya*(astringent), *Plavata* (float)
Pitta	*Krushna*(black) *Nila* (blue) *Peeta*(yellow) *Tamra* (red) *Varna, Tikta*(bitter) *Katu* (pungent) *Amla*(sour) *Anurasa, Kunapa* (dead body) *Rudhira* (blood) *Gandha, Brusha Ushna*(warm).	*Amla Sakatu, Rajyubhasi* (thread like)
Kapha	*Atyarthashukla*(white), *Atimadhu*(more sweet), *Lavana* (salty) *Anurasa, Ghrita Taila Vasaa Majja Gandha, Picchila*(slimy)	*Ghana*(thick/hard), *Picchila, Avaseedati* (sink)
Graha (9)	*Shakuni Graha* turns the taste to *Katu, Tikta Skanda Graha* is having the *Tridoshaja Lakshana* In *Putana Graha*, the taste will be *Madhura, Katu*, and leads to an increase in urine and feces.	

Table 2: type of *Stanya Dushti* according to different Acharya

According to Charaka	**According to Harita**	**According to Susruta (12)**	**According to Astanga**
Vataja: *Vairasya Phena sanghata Rukshya* ***Pittaja***: *Vaivarnya Dourgandhya* ***Kaphaja***: *Sneha Picchila*	*Alpa Ushna Amla Ghana Kshara*	*Vataja Pittaja Kaphaja Sannipataja Abhighataja*	*Vataja Pittaja Kaphaja Vatapittaja Vatakaphaja Pittakaphaja Sannipataja*

Aim and Objectives

Aim of the study:

To evaluate the quality of *Stanya* through its physicochemical properties and features as per Ayurveda.

Objectives of the study:

- To establish assessment criteria to evaluate *Stanya Dushti* through basic sciences.
- To evaluate the *Stanya* by observing the organoleptic property
- The experiment of its physicochemical properties of protein estimation, viscosity, pH value, and density.
- To assess the *Dosha* of breast milk by *Jala Pariksha* (dispersion)

Material and methods

Research design

The present study was observational as the cross-sectional study of the physiological and pathological status of breast milk through physicochemical analysis and Ayurveda principles (organoleptic). It intended to collect the data as well as experiment to analyse the physiochemical analysis at one point in time in 3 months.

Ethical clearance

The topic of the study, together with the case proforma was submitted to the Institutional Ethical Committee of the university. The significance aim and objectives, methodology, and probable outcome of the study were clarified to the committee and ethical clearance was obtained for the conduction of the study with ref. no. MGACHRC/IEC/MAR-2023/695.

Source of Data

Lactating mother of more than 4 weeks post-natal period from OPD of paediatrics AVBRH, Sawangi, and nearby vaccination centres in Salod and Wardha.

Method of collection of samples

60 lactating women who fulfilled the inclusion criteria were enrolled in the study after explaining the intention and outline of the study to the mother, informed consent was obtained from the participants and the copy is attached to the proforma in the

annexure. Collection of breast milk was done irrespective of caste, religion, age, sex, and socioeconomic status. The breast milk sample was collected in a sterile bottle by the mother by hand expression method. The massage was done before the expression of breast milk for easy expression and proceeded by washing and drying to maintain sterile and then collected a minimum of 20 ml was sufficient for all tests. The collected breast milk was tested on the same day to maintain the nature of the breast milk.

Place of study

The study was conducted in the Central Institutional Research lab, Mahatma Gandhi College of Ayurveda Hospital and Research Centre, Salod (H).

Study period: 1 year

Inclusion criteria

- The lactating mothers whose breastmilk becomes mature after 1 month from transitional milk.
- Primi and multi gravida

Exclusion criteria

- For mothers who were not willing to participate.
- Mothers who were not breastfeeding and give birth to premature children.
- Mothers who lost their children.
- Mothers whose children were below 4th week post birth (neonatal age).

Method of the study

The lactating mothers satisfying the inclusion criteria were enrolled and informed consent was taken. Detailed information of mother and child as per the particular research proforma prepared for the study. The freshly collected sample was assessed based on the Ayurveda principles including the organoleptic study as well as the physicochemical analysis and observation was noted.

Assessment criteria

The organoleptic characteristics (Table 3) of milk were studied for the assessment of taste, smell, and colour. These were assessed by the investigator, taste was assessed by tasting a few drops of milk, smell by smelling directly from the bottle containing the milk sample, and colour by seeing in natural light lid room.

The method of *Jala Pareeksha*(Table 3) was done by dropping a single drop of milk from the same height of 5 cm. The water was taken in a transparent beaker at the same level as the 100ml beaker and milk was dropped from a height of 5 cm and then observe the characteristic of dispersion of milk in the water as per the quality of Dosha. This was done three times to see the changes and make a precise result as per the inference given in Charaka Samhita and Susruta Samhita (7, 8).

Laboratory examination viz., pH, viscosity, density, and protein estimation (Table 4) were carried out as per the standard method

Table 3: subjective assessment parameter

Sr. No	Parameter	Test	Observation	Interpretation
1	Colour	Colour on natural light	Conch shell, whitish, yellowish, greyish. The standard colour code chart is used from book store	*Shuddha, Kapha, Pitta,*and *Vata* respectively.
2	Dispersion in water	Dispersion method (as told in Ayurveda text)	Immediate dispersion, White streak/ sedimentation, Float on water	*Shuddha, Kapha,*and *Vata* respectively.
3	Smell	Sense of smell	Natural smell, dead body, ghee, oil, no smell.	*Shuddha, Pitta, Kapha,*and *Vata* respectively.
4	*Rasa* and *Anurasa* (after taste)	Sense of taste	*Madhura* (sweet), Ati-Madhura rasa *Katu* (pungent), *kashaya* (astringent), *and Lavana* (salty). Anurasa -*Kashaya*	*Shuddha, Kapha, pitta,* and *Vata* respectively.

Table 4: Objective assessment parameter

Sr. No	Parameter	Test	Observation
1	Protein estimation	Lowry assay	Percentage of protein
2	Viscosity	Viscometer	Reading in centipoise
3	pH	pH meter	Reading of pH
4	Density	Hare's apparatus	Reading in g/cc

Observations and Results

In this study, 60 participants were enrolled. The mean age of the child was found as 5 months, and the mean age of the mother was 29 years. Mean values (table no 10) of pH, viscosity, density, and protein were found as 6.91, 1.64 cP, 1.02 gm/cc, and 1.72% respectively. Male child was found 56.7% (34) and female child was 43.3% (26). Mode of delivery was seen to be more of LSCS with 58.3% and FTND was 41.7%. The diet of the mother was the maximum vegetarian diet with 68.3% and only 31.7% of mixed diet. 25% of the participants had a history of NICU stay which was low compared to those with no history of NICU stay (75%). Among the enrolled participants, *Prakriti* of the mother was of 6 types including PV, PK, KV, VK, VP, and KP with 5(8.3%), 5 (8.3%), 16 (26.7%), 6 (10%), 15 (25%), and 13 (21%) respectively. The colour of breast milk (table no 5) was found as blackish white (*Vata*), white (*Shuddha*), and yellowish

(*Pitta*) with 3(5%), 32 (53%), and 25 (45%) respectively. The *Jala Pareeksha*(table no 6) was found as *Kapha* 19 (31%), *Shuddha* 26 (43.3%), and *Vata* 15 (25%). All of the breast milk was found to have *Madhura Rasa* and *Kashaya Anurasa* 54 (90%), and *Madhura Anurasa* 6 (10%) (table no 7). The smell of breast milk (table no 8) was observed as having a characteristic smell of 56 (93.3%), and a ghee smell of 4 (6.7%). The *Dosha* dominance (table no 9) of breast milk was of 5 types including *Kapha-Pitta* 15 (25%), *Kapha* 5 (8.3%), *Vata-Pitta* 7 (11.7%), *Vata* 7 (11.7%), and *Pitta* 3 (5%). *Shuddha Stanya* (pure milk) was found in 23 (38.3%). Of 17 (28%), the infants of the participants are exhibiting clinical symptoms of either coryza, vomiting, indigestion, fever (mild), which is mild and the remaining does not have any symptom.

On application of the chi-square test, the age of the child, age of the mother, gender of the child, socioeconomic status, religion, mode of delivery, diet, and history of NICU stay were found non-significant. *Prakriti* (table no 12) of the mother was found significant (p-value=0.043) with *Shuddha* and *Ashuddha Stanya*. Among the physicochemical analysis (table no 11), viscosity and protein were found significant in *Shuddha* and *Ashuddha Stanya*. Presences of symptoms (table no 13) in infants were found highly significant (p-value=0.01) with *Shuddha* and *Ashuddha Stanya*. The symptoms were seen only in *Ashuddha Stanya* group. The symptoms observed were coryza, vomiting, indigestion and fever. Hence, it can be inferred that *Ashuddha Stanya* increase the susceptibility of diseases in infants.

On application of ANOVA, the physicochemical analysis with each *Stanya Dushti* was found non-significant. The pH (p-value-0.42), Viscosity (p-value=0.36), density (p-value=0.05), and protein (p-value=0.08).

Table 5: Frequency distribution of colour

Colour	Frequency	Percent
Blackish white	3	5.0
White	32	53.3
Yellowish	25	45.0
Total	60	100.0

Table 6: Frequency distribution of dispersion

Dispersion	Frequency	Percent
Kapha	19	31.7
Shuddha	26	43.3
Vata	15	25.0
Total	60	100.0

Table 7: Frequency distribution of *stanya* After Taste

After Taste	Frequency	Percent
Kashaya	54	90.0
Madhura	6	10.0
Total	60	100.0

Table 8: Frequency distribution of Smell

Smell	Frequency	Percent
Ghee	4	6.7
Natural smell	56	93.3
Total	60	100.0

Table 9: Frequency distribution of Milk

Milk	Frequency	Percent
Kapha -Pitta	15	25.0
Kapha	5	8.3
Shuddha	23	38.3
Vata-Pitta	7	11.7
Vata	7	11.7
Pitta	3	5.0
Total	60	100.0

Table 10: Descriptive Statistics pH, Viscosity, Density, protein

Descriptive Statistics	pH	Viscosity (cP)	Density (gm/cc)	Protein (%)
Mean	6.91	1.64	1.02	1.72
Median	6.76	1.67	1.02	1.69
Std. Deviation	0.43	0.18	0.003	0.24
Minimum	6.19	1.31	1.02	1.24
Maximum	7.66	2.03	1.03	2.25

Table 11: Mean Comparison of physicochemical analysis among study subjects

Group	Group	N	Mean	Std. Deviation	Std. Error Mean	t-test	P-value
pH	*Shuddha*	23	6.87	0.45	0.094	-0.577	0.566
	Ashuddha	37	6.93	0.42	0.072		
Viscosity (cP)	*Shuddha*	23	1.58	0.18	0.037	-2.053	0.046
	Ashuddha	37	1.67	0.18	0.03		
Density (gm/cc)	*Shuddha*	23	1.02	0.003	0.0006	1.796	0.078
	Ashuddha	37	1.02	0.003	0.00005		
Protein (%)	*Shuddha*	23	1.61	0.18	0.037	-3.213	0.002
	Ashuddha	37	1.79	0.25	0.043		

International Journal of Ayurvedic Medicine, Vol 15 (2), 2024; 431-436

Table 12: Frequency distribution according to the *Prakriti* (mother) among study subjects

Prakriti (Mother)	*Shuddha*	*Ashuddha*	Total	Chi Sq.	P-value
PV	0 (0.0%)	5 (13.5%)	5 (8.3%)	11.442	0.043
PK	1 (4.3%)	4 (10.8%)	5 (8.3%)		
KV	11 (47.8%)	5 (13.5%)	16 (26.7%)		
VK	2 (8.7%)	4 (10.8%)	6 (10.0%)		
VP	6 (26.1%)	9 (24.3%)	15 (25.0%)		
KP	3 (13.0%)	10 (27.0%)	13 (21.7%)		
Total	23 (100.0%)	37 (100.0%)	60 (100.0%)		

Table 13: Frequency distribution according to the symptoms present in infants among study subjects

Symptoms present	*Shuddha*	*Ashuddha*	Total	Chi sq.	P – Value
No	23 (100.0%)	20 (54.1%)	43 (71.7%)	14.745	<0.01**
Yes	0 (0.0%)	17 (45.9%)	17 (28.3%)		
Total	23 (100.0%)	37 (100.0%)	60 (100.0%)		

Discussion

Examination of breast milk is required in cases to see the dominance of *Dosha* and to recognize spoiled milk which was expressed and kept for a certain amount of time to avoid any diseases or discomfort to the infant. Studies in this area are very few and hence this study was carried out to provide evidence-based results. As such modern science does not describe the abnormality of breast milk and there is no such test or investigation to assess the abnormality of breast milk. On examination, in fresh milk, *Stanya Dushti* can be seen ~~as that~~ which has *Dosha* dominance, and as per that *Dosha*, we can advise the change in *Ahara*(food) and *Vihara*(activity) to mother for the prevention of diseases caused by particular *Dosha Prakopa* (increase). In another case where the breast milk was expressed and kept like nowadays in the freezer or at room temperature, *Stanya Dushti* can be taken as the milk has different types of smell, taste, and colour, and on dispersion on water forms the features of *Dushti* and this *Stanya Dushti* is considered to spoil the homogeneity of *Doshas* and not advised for intake. In Ayurveda, *Ashuddha Stanya* is not contraindicated but treatment can be advised to the mother for balancing the *Dosha*. Physiologically, *Dosha* variation occurs in the body depending on various factors like *Kala*(time), *Ritu* (season), *Prakriti* (body constitution), etc. (14). Dosha dominance can be seen in breast milk and continuous consumption of such *Dushta Stanya* may give rise to diseases in the future by the principle of *Khavaigunya*(susceptibility) (15). Hence, treatment to the mother is given to prevent any risk factor.

The colours of *Aruna, Nila*, and *Tamra* were not seen in this study. The colour of brown and red can be seen in rare cases of rusty pipe syndrome (16). A case in which the colour of breast milk was seen to be green in colour due to the intake of blue-green algae (17). The colour also depends on lighting which can create the vision of colour different from its original colour. The after-taste found were *Kashaya Anurasa* in 90% and *Madhura Anurasa* in 6%. The *Anurasa* like *Tikta, Amla, Katu*, and *Lavana* is not present in this study, and this is also a subjective parameter that can be different based on the taste of different individuals as the taste perceived by a different person may have some differences depending on their *Agni, Ama*, etc (18). The *Gandha* perceived in the study was the characteristic smell of milk in 93.3% and 6.7% mild smell of Ghee. The breast milk was analyzed freshly as soon as collected and the smell of *Kunapa Rudhira* may be perceived in milk which is kept for some time or when the milk was spoiled after some time after the expression. The smell of *Taila, Vasaa*, and *Majja* may be perceived in breast milk having a high content of fat or during colostrum milk but in this study, the milk was collected after the end of colostrum and transitional milk which is after 4 weeks of the post-natal period. In *Jala Pariksha*, *Kapha* indicates that the milk has *Guru Guna* (19) and hence sinks faster to the bottom on dropping in a pot of water or a flask of water i.e. *Avasadita*. *Shuddha* is when the milk gets mixed easily on dropping in a flask of water showing its purity and its *Laghuta* (lightness) (19) which is easy for digestion and prevents any digestive problems, making the child satisfied and avoiding irritability symptoms in the baby. *Vata* dominance is when the milk spreads on the water easily and there is a remnant that floats on top of the water showing the characteristic of *Vata* i.e. *Plavana.* This is caused by the *Laghu Guna* of the milk showing the dominancy of *Vata* (19).

The cause of *Stanya Dushti* was seen to be related to the *Ahara Vihara* of the mother. Those who appear to have more weight, a sedentary lifestyle, and consume a non-veg diet have a high chance of having *Kapha Dushta Stanya* or *Pitta Dushta Stanya* which is directly correlated with the *Prakriti* of the mother. Nowadays, breast milk can be contaminated with chemicals and toxins by the uncontrolled population and pollution. The increase in industrialization, vehicles, and improper waste disposal increases the risk of pollution in the environment. Chemical contaminants are polychlorinated biphenyls, DDT, dioxins, dibenzofurans, polybrominated diphenyl ethers heavy metals, etc. (20). *Stanya Dushti* can also lead from the consumption of fast food which vitiate the *Dosha* especially *Vata* and disrupt *Agni*. *Stanya Dushti* may raise health issues for the infants. The examination of breast milk can be carried out in our daily practice to see the dominance of *Dosha* by organoleptic studies and

Jala Pariksha and then provides the basic principle of management by changing the dietary and lifestyle of the lactating mother to prevent diseases that create discomfort and hinders the proper growth and development of the infants. Knowing the *Stanya* is *Shuddha* or *Ashuddha* is beneficial in the prevention of any unwanted disorder. Intake of *Shuddha Stanya* will give benefits of *Jeevaniya, Brimhaniya, Satmya, Snehana* (7)*, Avyahatabalaangaayu, Vardhate Sukham, Pushtikara* and *Arogyakara* (21). *Shuddha Stanya* is also indicated in the treatment of *Raktapitta* and eye disorder (7). Intake of *Shuddha Stanya* was found to prevent various diseases in later life as it plays an important role in maintaining a healthy gut microbiome (22). It decreases the risk of diseases such as inflammatory bowel syndrome, respiratory problems, allergies, and inflammatory problems (23). *Ashuddha Stanya* cause different diseases in infants like *Vata Dushta* causes *Durbala, Vrudhi, Swara Kshinata, Mala Mutra Vayu Avarodha, Shirashoola,* and *Peenasa. Pitta Dushta* causes *Swedadhikya, Trishna, Dravamla pravritti, Shareera sparshaushna, Pandu, Kamala. Kapha* causes *Chardi, Lalasrava, Kasa, Swasa, Tamakasvasa, Mukhanetrapradeshishotha, Hrudroga* (24).

Conclusion

The study showed evidence of *Shuddha* and *Ashuddha Stanya.* The symptom were seen in *Ashuddha Stanya* which were causing mild discomfort but did not cause major problems. 38.3% were *Shuddha* and 61.7% were *Ashuddha* with 25% *Kaphapitta*, 8.3% *Kapha*, 11.7 *Vatapitta*, 11.7 *Vata*, and 5% *Pitta* dominance. Examination of breast milk for dominance of *Dosha* is beneficial for the prevention of diseases in infants caused by *Dosha Prakopa*. The research study's aim and objectives were diligently pursued and effectively fulfilled, providing valuable insights into the subject matter. The physicochemical analysis except for viscosity and protein was not significant in *Shuddha* and *Ashuddha Stanya*.

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