

REVIEW ARTICLE

Image Based Smartphone Application for *Purisha Pariksha* – An Exemplar for Digital Health

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ABSTRACT

A wide, multidisciplinary notion called “digital health” or “digital healthcare” is an intersection between technology and healthcare. The purpose of the Global strategy on digital health (2020-2025) is to strengthen health systems through the application of digital health technologies for consumers, health professionals, health care providers and industry towards empowering patients and achieving the vision of health for all. Stool examination is one among the prime laboratory investigative tool in Medicine and in so many conditions it helps to confirm the diagnosis. Dosha, Dhatu, Agni and Mala are main factors to define Swastha and Aswastha awastha of an individual. And in Astha Sthana Pariksha, Mala Pariksha stands on third place. *Purisha Pariksha* have been mentioned in various disease conditions by Brihatrayi in scattered manner. This work should be done with collaboration of Advance technical experts. Images of different conditions of *Purisha Pariksha* are collected with special reference to Classical text books. In back-end, Machine learning algorithms using Python language to process the image of *Purisha*. In front end, we can use app for user interface. This attempt may help to differentiate physiological and pathological *Purisha*, by the Image based smartphone app.

This innovative project may help to assess Agnibala, Symptoms of abnormal dosha, Ama and Niraama Mala for the well-being of entire mankind. We have already touch down twenty-first century, an era of digitalization and modernization. So, evidence-based studies are only valid today, it is inevitable to incorporate technology for more acceptability and understanding of various Ayurvedic concepts at global level.

1. INTRODUCTION

Digital health applies digital transformation to the healthcare field, utilising sensors, software, networking, and computer platforms for health care and related purposes. According to Deloitte Insights, digital health employs more than just

technologies and tools; it also views “radically interoperable data, artificial intelligence (AI), and open, secure platforms as central to the promise of more consumer-focused, prevention-oriented care.”

Dosha, Dhatu, Agni and Mala are main factors to define health of an individual¹. *Purisha* falls under Sharirika Mala, which is further broken down into Mutra, *Purisha*, and Sweda. Diseases will develop if metabolic waste products are not eliminated from the body. The ancient and mediaeval texts of Ayurveda do not specifically describe the physical characteristics of normal stool, such as Gandha (odour),

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Sparsha (touch), Varna (colour), and Vaishadya (unstickness/clearness), but stool examination has been given due importance in the context of the diseases. Acharya Charaka designated only the Pramana (amount) of the Purisha as Sapta Anjali Pramana². Jeerna Mala Lakshana was described by Acharya Yogarantakar, although there are no specific requirements for colour, consistency, stickiness, or anything else³. In patient of rajyaksma purisha is considered as 'Balam tasya hi vidbalam'. Acharya Sushrut and Vagbhat mentioned it as Upasthambha⁴ and Avastambha⁵, respectively, which indicate one that supports the body⁶

Necessity of Purisha Pariksha

To know the condition or type of agni

To prognose the disease, For example - Asadhya Rogi Mala Lakshana

To identify symptoms of abnormal Doshas such as Dridhata and Shuskata in Vata Vikriti person.⁷

To identify intestinal bleeding, infestation, Inflammatory diseases, Malabsorption.

To detect presence of Krimi⁸ - worms like adult worms, segments of tapeworms, larvae, ova, and protozoa (trophozoites or cysts).

To rule out different causes of Diarrhoea, evaluation of chronic diarrhoea, dysentery.

To identify infection by bacteria like Shigella, Salmonella, Vibrio, Yersinia, or Clostridium difficile can be identified by stool culture.

Table 1 shows the Different Color of stool in different conditions.⁹

Table 2 shows Different Consistency of stool in different conditions.¹⁰

In Ayurveda, there are two methods of Purisha Pariksha.¹¹

1) Physical examination of stool.

2) Jala Nimajjan to detect the presence of Ama. (Charak Chikitsa sthana Grahani Adhyaya)

Darshan Pariksha is very important because seeing is different from observing, because of this, we say "observe the patient" rather than "see the patient."

Table 3 shows Different Color of stool in different conditions described in Ayurveda¹²

Table 4 shows Different Consistency of stool in different conditions described in Ayurveda¹³

1.1 Aim:

To develop image-based smartphone application for Purisha Pariksha.

1.2 Objectives:

- 1) Images of different conditions of Purisha are collected.
- 2) Images are saved in database for analyzation in terms of Color and Consistency.
- 3) Analyse the Saam and Niraam conditions of the Purisha, Dourgandhya, Shulayukta etc.

2. Methods

This work should be done with collaboration of Advance technical experts.

Different type of Images of *Purisha* based on various colors, consistency mentioned in Samhitas and other related classical literatures should be collected. And saved in database.

In back-end, Machine learning algorithms using Python language to process the image of Purisha. In front end, we can use app for user interface.

Based on that data base, variations mentioned in the *Purisha Pariksha* should be attached and will use for differential diagnosis as well as provisional diagnosis with the help of clinical features of patient.

This software aids in determining the consistency of the stool after colour. Whatever was shown by the Bristol stool test, our Acharyas have already spoken of these consistencies in terms of *Atibaddha*, *Baddha*, and other factors. Data from various consistency of stool photos will be saved, and only traditional names will be used. (In Figure 2)

Figure 2:

The third phase is to analyse the Saam and Niraam conditions of the Purisha, Dourgandhya, Shulayukta, etc - using the questioning approach by questionnaire method in the app.

3. DISCUSSION:

Ayurveda the rich Indian medical heritage, wisdom provided by Ayurveda through its fundamental principles is everlasting in Universe. We have already touch down twenty-first century, an era of digitalization and modernization. It will be helpful to introduce Ayurveda to a global audience. The 2030 Agenda for Sustainable Development highlights that the spread of information and communications technology and global interconnectedness has great potential to accelerate human progress, to bridge the digital divide and to develop knowledge societies. Therefore, Need of App in present era is also discussed. According to Susan Biddle, senior director of healthcare at Fortinet- "The healthcare industry is in the midst of a technological transformation with the goal of improving patient care, and it needs to be ready to support this progression"

The objectives of the Global strategy on digital health (2020-2025)¹⁴ are as follows

Promote global collaboration and advance the transfer of knowledge on digital health.

Advance the implementation of national digital health strategies.

Strengthen governance for digital health at global, regional and national levels.

Advocate people-centred health systems that are enabled by digital health.

Hence the use of a smartphone app for *Purisha Pariksha* was used to illustrate how digital techniques could be used

in Ayurveda. This is merely a hypothesis regarding *Purisha Pariksha*; a proper clinical examination should be used to make the diagnosis. By using an image-based smartphone app, this endeavour could aid in distinguish between physiological and pathological *Purisha*.

4. CONCLUSION:

This innovative project may help to assess *Agnibala*, Symptoms of abnormal *dosha*, *Ama* and *Niraama Mala* for the well-being of entire mankind. Hence with the example of Image based smartphone app for *Purisha Pariksha*, highlighting the application of Digital techniques in Ayurveda.

5. ACKNOWLEDGMENTS

None.

6. AUTHORS' CONTRIBUTIONS

All the authors contributed equally in design and execution of the article.

7. FUNDING

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8. ETHICAL APPROVALS

This study not required ethical approval

9. CONFLICTS OF INTEREST

Nil

10. DATA AVAILABILITY

This is an original manuscript and all data are available for only review purposes from principal investigators.

11. PUBLISHERS NOTE

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Figur 1: In the app, it will seem as follows: after analysing the photograph, it will provide the differential diagnosis associated with it.



*Krishna Var-
na*

*Vatika Arsha
Vatika Gulma
Kumbha Kamala
Paittika Atisara
Vata Prakopa*



*Harita
Var-na*

Halimak

Figure 2:

CONSISTENCY OF STOOL			
1.		Separate hard lumps	Atibaddha
2.		Lumpy and sausage like	Baddha
3.		A sausage shape with cracks in the surface	Samyak
4.		Smooth, soft sausage or snake	Samyak
5.		Soft blobs with dear-cut edges	Samyak
6.		Mushy consistency with ragged edges	Alpa Dravayukta
7.		Liquid consistency with no solid pieces	Ati Dravayukta

1. Table 1- Different Color of stool in different conditions.

Brown	Normal
Black	Bleeding in upper gastrointestinal tract (Proximal to cecum), Drugs (iron salts, bismuth salts, charcoal)
Red	Bleeding in large intestine, undigested tomatoes or beets
Clay colored (gray-white):	Biliary obstruction
Silvery	Carcinoma of ampulla of Vater

Table 2 - Different Consistency of stool in different conditions.

Watery	Certain strains of Escherichia coli, Rotavirus enteritis, cryptosporidiosis
Rice water	Cholera
Unformed with blood and mucus	Amebiasis, inflammatory bowel disease
Unformed with blood, mucus, and pus	Bacillary dysentery
Unformed, frothy, foul smelling, which float on water	Steatorrhea

Table 3 - Different Color of stool in different conditions described in Ayurveda¹²

S.No.	Types of Color	Conditions involved
01	<i>Krishna Varna</i> (black color)	<i>Vatika Arsha, Vatika Gulma, Kumbha Kamala, Paitika Atisara, Vata Prakopa</i>
02	<i>Shyava, Aruna varna</i> (grey and reddish color)	<i>Vatika Udaroga, Vatika Arsha, Vatika Atisara, Vata Prakopa, Vataja Pandu, Vata Gulma, Vata Jwara.</i>
03	<i>Shukla Varna</i> (white color)-	<i>Shleshmika Jwara, Shleshmika Udararoga, Shleshmika Arsha, Shleshmika Pandu, Shakhashrita Kamala, Shleshmika Atisara, Sahaja Arsha, Kaphaja Gulma, Kaphaja Visarpa, Jalodara.</i>
04	<i>Rakta Varna</i> (red color)	<i>Kamala, Pittja Atisara, Raktapitta, Sahaja Arsha, Chhidrodara.</i>

Table 4 - Different Consistency of stool in different conditions described in Ayurveda¹³

S.No.	Types of Consistency	Conditions involved
01	<i>Sandra</i> (dense)	<i>Kaphaja Atisara, Sahaja Atisara And Arsha</i>
02	<i>Baddha/vibaddha</i> (solid)	<i>Asadhya Pandu, Vataja Prameha, Udara Roga, Baddhodara, Purishishavrita Vata, Ashuddha Dughdhapna Sevana, Tridosha Dushti, Tikshagni, Vataja Atisara, Mahashvasa, Vataja Visarpa, Vataja Jwara, Sahaja Arsha, Vataja Arsha, Malavrita Vata.</i>
03	<i>Drava</i> (watery)	<i>Pattika Arsha, Vatika Grahani, Asadhya Atisara, Mandagni</i>
04	<i>Bhinna</i> (loose)	<i>Pattika Arsha, Shleshmika Grahani, Kshayaja Kasa, Pittja Murchha, Vegasandharanjanya Yakshma, Arsha Samanya Lakshana, Kaphavrita Apanavayu.</i>
05	<i>Shushka</i> (dry)	<i>Vataja Grahani and Sahaja Arsha.</i>