

**EXPERIMENTAL RESEARCH ON LENGTH OF INTESTINE
ACCORDING TO CLASSICAL TEXT AND MODERN SCIENCE**

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ABSTRACT

Intestine is the longest organ in human body which play very crucial role in digestion of food and absorption of digested food nutrients by Small Intestine and also in excreting the waste food material out of the body by Large Intestine. As intestine in human body is the longest organ compared to other organs, Small Intestine is around 600 cm in length and Large Intestine is around 150 cm in length. In this present study we are going to study about the length of intestine stated by modern science and length stated by *Acharya Sushrut* in classical text. We are going to prove that the length of Intestine stated according to modern science is same as the length if *Antra* (Intestine) stated by classical text. For this study we have compared the length of intestine in various modern text with the length stated according to Classical text by converting the length of *Antra* in cm. Also, we conducted a

study in which we performed dissection on 6cadavers in our department of *Rachana Sharir* and measured the length if arm span and compared it with the length of intestine of that same cadaver. Result shows that the length of Intestine in same as the Length of *Antra* stated in classical text.

KEY WORDS: Intestine, *Antra*, *Wyams*, Arm span, *Anguli*.

Aim:- Detailed Literary and Experimental study about length of Human intestine.

Objective

1. Study about length of human intestine as per modern text.
2. Study about length of human intestine as per classical text.
3. Study about length of human intestine as per cadaveric dissection.

INTRODUCTION

Ayurveda, an ancient system of medicine originating from the Indian subcontinent, offers a comprehensive understanding of the human body, including the intestines.^[1] In *Ayurvedic* texts, the *Antra*^[2] (intestines) are considered a crucial part of the digestive system and play a vital role in integral to digestive health, which is considered fundamental for overall well-being according to *Ayurvedic* principles. While according to modern science the intestines are also a crucial part of the digestive system in both male and female human bodies. They are responsible for breaking down food, absorbing nutrients, and expelling waste. The intestines are divided into two main sections: the small intestine and the large intestine (colon). Food that humans eat enters in the intestine after processing through stomach. The Small and Large Intestine in human body are the longest organ compared to other organs which have combined length around 750 cm. According to modern science intestines are divided into two parts Small Intestine and Large Intestine.

Literary study of human intestine as per modern text

The intestine, which is the longest part of the digestive tube, is divided into long, less distensible, Small Intestine, and shorter more distensible Large Intestine.

Small Intestine:-

The small intestine extends from the pylorus to the ileocaecal junction. It is about 600 cm long.^[3] The length is greater in males than in females, and greater in cadavers, due to loss of tone than in the living.^[4] Small intestine consists of three parts: the duodenum, the jejunum, and the ileum. Duodenum is the first and shortest part, about 25 cm long, and receives partially digested food from the stomach. Jejunum is the middle part, where most of the absorption of nutrients occurs. Ileum is the final part of the small intestine, connecting to the large intestine. The primary function of the small intestine is the absorption of nutrients such as carbohydrates, proteins, fats, vitamins, and minerals from the digested food. The small intestine has numerous finger-like projections called villi and microvilli, which increase its surface area for better absorption.

Large Intestine

The large intestine is located in the lower abdomen, surrounding the small intestine. It is shorter than the small intestine, around 150 cm long in adults.^[5] Large intestine consists of many parts: the cecum, colon (ascending, transverse, descending, and sigmoid), and rectum. Cecum is a pouch-like structure at the beginning of the large intestine, where the appendix is attached. Colon is the longest part of the large intestine, responsible for absorbing water and electrolytes and forming feces. Rectum is the final part of the large intestine, where feces are stored before being expelled through the anus. The main functions of the large intestine include absorbing water and electrolytes from undigested food, forming feces, and storing fecal matter until it is ready to be expelled. The colon is wider than the small intestine and has a relatively smooth inner surface compared to the villi-covered surface of the small intestine.

Male and female intestines have the same basic structure and functions. However, there may be some anatomical differences between male and female intestines due to variations in pelvic anatomy and reproductive organs. For example, in females, the large intestine may be slightly longer due to the presence of the uterus and other reproductive organs in the pelvic cavity. The combined length of small and large intestine in humans can be around 750 cm long according to modern science.

Literary study of human intestine as per classical text

In classical text the length of *Antra* (intestine) in human intestine is described in *Wyams*^[6] by *Acharya Shushrut* which is 3.5 *Wyams* in males and 3 *Wyams* in females. One *wyam* is called as Arm span^[7] [tip of middle finger of one hand to the tip of the middle finger of the other hand while both hands are fully outstretched]. It was previously believed that the armspan of a person is equal to the height of that same person.^[8] Height of human according to *Acharya Sushrut* is 120 *Anguli*^[9] but according to *Acharya Dalhanacharya* Height stated by *Sushrut* is calculated while standing upright on toes while stretching the hands straight upwards which increases the normal height by 36 *Anguli* so the normal height while standing should be 84 *Anguli*. And as per the distance of one *wyam* is equal to the height of that person so the calculated length of one *Wyam* in *Anguli praman* is also 84 *anguli*. According to statement of *Acharya Dhalhanacharya* we can say that the actual Height of human is 84 *anguli*.^[10] Whereas modern calculations are concerned average of one finger width can be measured about 2 cm.^[11] So the length of one *wyam* i.e. 84 *angul* will be 168 cm. As *Acharya*

Sushrut said Length of *Antra* in Human male is 3.5 *wyam* which is 588 cm or and in human female 3 *wyam* which is 504 cm in an average.

Study of human intestine as per cadaveric dissection

Cadaveric dissection^[12] is the traditional way of teaching anatomy after theoretical lessons and discussions on the atlas images. Medical students gain knowledge and strengthen theoretical data through visualization of real anatomic structures. Additionally, by practicing on cadavers they touch and feel the anatomic relations more efficiently. Owing to the role of cadaveric dissection in generating a three-dimensional (3D) perspective, and providing an easy way of understanding and recalling anatomic structures.

We have conducted the dissection of human cadaver in our department of *Rachana Sharir*. We conducted study on 6 cadavers in total from which 4 were male and 2 were female cadavers. In that study we measured the length of arm span and compared it with the length of small intestine of the same cadaver. On an average the length of the small intestine was nearly about 3.5 times that of the arm span of each cadaver. On an average length of small intestine is around 600 cm, which is little longer than the length stated in classical text. In classical text the length stated is 588 cm if calculated by the measurement of *Anguli Pramana*. The extra length of intestine is due to the loss of tone than in living because of post cadaveric anatomical changes.

Data collected by dissection of cadavers

Sr.No.	Gender of cadaver	Arm Span of Cadaver in cm.	Length of small intestine of that cadaver in cm.
1.	Male	174	621
2.	Male	167	596
3.	Male	180	646
4.	Male	164	588
5.	Female	158	565
6.	Female	156	559

CONCLUSION

As the measurements are concerned the calculated length of *Antra* according to *Acharya Shushrut* is 588 cm which is nearly equal to the length of Small intestine which is 600 cm. So we can conclude that the length which is stated by *Acharya Shushrut* is of Small intestine and not that of both Small and Large Intestine which is nearly equal to the modern text.

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