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Study of *Aama* and Dysbiosis for Future Microbiological and Biotechnological Advancement in *Ayurveda* - Case Controlled Literary Study

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ABSTRACT

Introduction: In *Ayurveda* there are various concepts that require special attention due to their complex nature and lack of understanding of human mind. One such concept is *Aama* that is so far considered as toxins or free radicles in body. Our limited understanding in advance sciences like biotechnology has limited us to understand these complex yet highly valuable concepts. Through this study we will try to understand *Aama* in the reference of gut biota dysbiosis and disease progression. **Aim:** To understand *Aama* in perspective of dysbiosis and establishing its direct relation with advance microbiological and biotechnological researches. **Methodology:** Study of major pathological conditions where *Aama* is involved, Study of affected biota and toxins (if involved/studied) in those conditions. And further evaluation using statistical test. **Discussion:** Such studies in the segment of *Ayurveda* can lead to understand the mechanism of various functional dynamics of body as described in *Ayurveda*. This can be helpful in developing the concepts further and enhance our understanding toward complexity of human body. Future of this study can be seen as complete understanding of this concept of *Aama*. Further using biotechnological tools we can develop investigations module for confirming presence or amount of *Aama* present in cell or body. Further studies in medicine can help us rule out the most appropriate medicines for various pathological groups of organisms.

Key words: *Aama, dysbiosis, biotechnology, microbiology*

INTRODUCTION

In *Ayurveda* pathology usually begin with dysfunction of *Agni* and formation of *Aama*. From a long time these terminologies were just guessed as break in digestive pathways. Their correct assessment is an important step to provide explanations of treatments that are only possible with *Ayurveda* approach so far. Dysbiosis is one such concept that seems to be related with the various pathologies explained in Ayurveda. Dysbiosis is defined as loss of gut microbiota. Compared to number of cell in body there are 100 times more bacteria present in human gut. These bacteria along with viruses and fungi form gut microbiota. This gut microbiota is very essential for proper functioning of various organs. Due to this gut micro biota various metabolic processes occur properly and chances of diseases are less. Imbalance in gut biota leads to blocked metabolic pathways, this brings chaotic inflammatory responses. All pathologies in *Ayurveda* are linked with break in digestive or metabolic pathways that is *Aama* formation. A similar approach is sensed in modern sciences under the lights of dysbiosis. Most of the diseases studied for the purpose so far are found to give a positive result for this. This break in metabolic and digestive pathways gives a clue where Ayurveda and modern sciences stands on shoulder to shoulder without disapproving the eternal concepts of Ayurveda and newly developed concepts of modern medicine.

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METHODOLOGY

Selection of cases

Since it is a case controlled literary study, therefore various diseases are taken as sample. Selection of diseases is done on the basis of *Charaka Samhita* and *Sushruta Samhita*, considering them as highest reference in *Ayurveda*. All the endogenous diseases studied in these *Samhita* are considered to contain *Aama* mechanism within them. Their corresponding modern parts are studied for dysbiosis mechanism. Modern parts are not the direct correlations of diseases mentioned in *Ayurveda*, but they are just one small part of their corresponding *Ayurveda* diseases.

CASE SIZE

Total 30 chapters are described in *Charaka Samhita*, *Chikitsa Sthanam* and 40 chapters in *Sushruta Samhita*. Out of 30 chapters in *Charaka Samhita*, 28 diseases are taken and out of 40 chapters in *Sushruta Samhita* 9 diseases are taken in consideration. Considering *Aama* in endogenous route and absence of *Aama* in exogenous route in pathology of diseases, total 37 diseases are considered as case size. Their counterpart modern diseases are also taken 37 in number.

Categorization of diseases

Diseases are categorized in two folds, first is Ayurveda parameter and other is modern. In Ayurveda further 2 classifications are made, as endogenous and exogenous. Term endogenous refers to the diseases that begin within body and consist *Aama* as an essential and unavoidable mechanism. Exogenous diseases are one that begin outside the body, and may contain *Aama* in later stages of diseases. *Aama* formation has no role in beginning these diseases. In modern section, 2 categorizations are made as diseases with dysbiosis and diseases without dysbiosis.

Conduction of study

This study is conducted in multiple steps, consisting of literary studies, evaluation of cases and statistical analysis. Diseases are studied for *Aama* section in Ayurveda and dysbiosis in modern. Mechanism of action of gut biota is studied and various microorganisms as well as involved metabolic pathways are noted. These parameters are tested for mutual relationship with *Aama* in body. Total 4 categories are made for our studies; these categories define the mutual relationship of both *Aama* and dysbiosis together. First category consists of both *Aama* and dysbiosis and number of diseases found under this section are 27. Second category mention *Aama* but no dysbiosis, number of diseases in this category are 6. Third category is no *Aama* but dysbiosis is present, total number of diseases in this category is 1. Last category is no *Aama* and no dysbiosis and no of diseases here are 3.

Statistical tool

Study of *Aama* along with dysbiosis is majorly a qualitative study, so non-parametric tests are taken into consideration. Specifically Fisher's test is used for fair calculation and analysis of research data. For the purpose of clean calculation site QUICKCALCS is used.

Exclusion criteria

Diseases affecting single part (e.g. - *Mukh Roga*) or minor diseases (e.g. - *Kshudra Roga*) are excluded.

Diseases from *Sushruta Samhita* that are already mentioned in *Charaka Samhita* are excluded.

Inclusion criteria

Diseases of both medicinal and surgical importance are considered. Only diseases from *Chikitsa Sthanam* from both *Samhita* are considered. Both endogenous and exogenous routes of diseases are kept in mind during the study.

RESULT

Agni Mandhya and *Aama* are the working dynamics of the body. Studies on *Agni Mandhya* and *Aama* suggested different opinions on each level of study. On gross level they are pathological agents, on *Dhatu* level they are vitiated *Dhatu*, on *Mahabhoot* level they are *Jala* and *Prathivi* dominant compositions. But at all the levels they are referred as pathological agencies and supposed to perform severe mischiefs within the body. Studies on dysbiosis strongly suggested the presence of some pathologies that are hidden deep within. On

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further examination it was found that gut biota through various pathological route affect various organs and become a crucial part of every pathology within the body. In modern medical sciences, various pathways related with organ and gut are referred in axis. Various axis has been defined since the discovery of gut's involvement in pathology of various organs. Most common channels found are - gut-lung axis, gut-joint axis, gut-brain axis etc. various papers related with each pathology are described below.

SN	Disease in *Ayurveda*	Disease in modern	Reference for dysbiosis
1.	*Jwara*	Covid case	Gut Microbiota Dysbiosis in COVID-19: Modulation and Approaches for Prevention and Therapy[1]
2.	*Rakta-pitta*	Epistaxis	-
3.	*Gulma*	Abdominal tumour	Intestinal dysbiosis promotes epithelial-mesenchymal transition by activating tumor-associated macrophages in ovarian cancer[2]
4.	*Prameha*	T2DM	Gut Microbiota: An Important Player in Type 2 Diabetes Mellitus[3]
5.	*Kushtha*	Psoriasis	Gut Microbiota in Psoriasis [4]
6.	*Rajyakshama*	T.B.	The gut microbiome in tuberculosis susceptibility and treatment response: guilty or not guilty?[5]
7.	*Unmaad*	ASD	Autism Spectrum Disorders and the Gut Microbiota[6]
8.	*Apasmaar*	Epilepsy	The gut microbiome in drug-resistant epilepsy[7]
9.	*Kshata-*Ksheen	Lung tissue tear	Dysbiosis, malnutrition and enhanced gut-lung axis contribute to age-related respiratory diseases[8]
10.	*Swauthu*	Inflammation	The interplay between microbiota and inflammation: lessons from peritonitis and sepsis[9]
11.	*Udararoga*	Peritonitis	The interplay between microbiota and inflammation: lessons from peritonitis and sepsis[10]
12.	*Arsha*	Haemorrhoids	Altered Gut Microbic Flora and Haemorrhoids: Could They Have a Possible Relationship? [11]
13	*Grahani*	FGID	Gut microbiota dysbiosis in functional gastrointestinal disorders[12]
14.	*Pandu*	Anaemia	-
15.	*Hikka-shwasa*	COPD	Association of Intestinal Microbial Dysbiosis With Chronic Obstructive Pulmonary Disease[13]
16.	*Kasa*	Age related respiratory diseases	Dysbiosis, malnutrition and enhanced gut-lung axis contribute to age-related respiratory diseases [14]
17.	*Atisaara*	FGID	Gut microbiota dysbiosis in functional gastrointestinal disorders[15]
18.	*Chardi*	FGID	Gut microbiota dysbiosis in functional gastrointestinal disorders[16]
19.	*Visarpa*	Erysipelas	-
20.	*Trishana*	Water-electrolyte imbalance	-

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21.	*Visha*	Poisoning	-
22.	*Madatya*	Alcoholism	Gut Microbiome Dysbiosis in Alcoholism: Consequences for Health and Recovery[17]
23.	*Dwi-braniya*	Diabetic Foot Ulcer	Gut Dysbiosis and Diabetic Foot Ulcer: Role of Probiotics[18]
24.	*Tri-Marmiya*	Cardiac Problems	Dysbiosis of Gut Microbiota With Reduced Trimethylamine-N-Oxide Level in Patients With Large-Artery Atherosclerotic Stroke or Transient Ischemic Attack[19]
25.	*Urustambha*	NMOSD	Dysbiosis of gut microbiota in patients with neuromyelitis optica spectrum disorders: A cross sectional study[20]
26.	*Vata-vyadhi*	Neurological disorders	Dysbiosis of Gut Microbiota from the Perspective of the Gut-Brain Axis: Role in the Provocation of Neurological Disorders[21]
27.	*Vata-Rakta*	Rheumatoid Arthritis	Gut-joint axis: Gut dysbiosis can contribute to the onset of rheumatoid arthritis via multiple pathways [22]
28.	*Yoni Roga*	reproductive diseases	Vaginal Probiotics for Reproductive Health and Related Dysbiosis: Systematic Review and Meta-Analysis[23]
29.	*Bhagandara*	Fistula	Intestinal Dysbiosis Disguised as a Rectal Fistula Treated With Autologous Fecal Microbiota Transplantation[24]
30.	*Sadhyo-Vrana*	Traumatic injury	-
31.	*Bhagana*	Fractures	-
32.	*Ashmari*	Renal stones	Gut microbiota in patients with kidney stones: a systematic review and meta-analysis[25]
33.	*Mood Garbha*	Pregnancy complication	Intestinal dysbiosis: An emerging cause of pregnancy complications?[26]
34.	*Vidradhi*	Abscess	-
35.	*Stana-Roga*	Breast cancer	Breast and gut microbiome in health and cancer[27]
36.	*Galaganda*	Thyroid disorders	Thyroid-Gut-Axis: How Does the Microbiota Influence Thyroid Function [28]
37.	*Braddhi*	Inguinal hernia	-

From above mentioned table diseases are classified in 4 sections of Fisher' table. There were 27 diseases in which dysbiosis was present and as well as *Aama* was noticed in them. Similarly in 6 diseases dysbiosis was absent but *Aama* was present. In 3 diseases both *Aama* and dysbiosis was absent and in only 1 disease dysbiosis was present but *Aama* was not. Fisher's exact test is a non-parametric test that consist a tabulated form of data. Data in table describe the number of observations acquired in experiment or study. On calculation by fisher's exact test, the two-tailed P value equals 0.0375. This shows that diseases having endogenous route are certainly linked with dysbiosis. In other words *Aama* is highly associated with dysbiosis.

***Ayurveda* / Modern**	**Dysbiosis present**	**Dysbiosis absent**	**Total**
Endogenous diseases	27	6	33
Exogenous diseases	1	3	4
Total	28	9	37

Through statistical analysis is seen that dysbiosis in modern and *Aama* in *Ayurveda* are related

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somewhere. But so far there are no evidences to prove this analogy. One way to understand this relationship is deep literary studies. Diseases with *Aama* show various constitutional as well as local symptoms. A similar observation is seen in dysbiosis. This symptom based approach is first clue of association between both of them. Best example for this condition is ASD (autism), here mental condition is detoriated but symptomatically all the features of *Aama* are present in patient clinically.[29] Similarly in LRT diseases, presence of *Aama* symptom[30] is another example that shows the presence of interconnection of various organs with gut, defining primary concept of Ayurveda रोगः सर्वेआपि मन्द् अग्नेः. Another clue is domination of auto-immune disorders in present time. Recent discoveries show that dysbiosis, leads to formation and activation of such compounds, that causes auto-immune diseases. All the immune diseases are directly or indirectly mentioned in *Ayurveda*. And their primary pathological conditions contain *Aama* as precursor of that disease.

Discussion

In Ayurveda pathology is defined on certain predefined sets of concepts. One such concept is suppression of *Agni* and formation of *Aama*. According to texts no pathology exist without the formation of *Aama*. Recent scholars of *Ayurveda* define this concept in terms of ADS (*Aama*, *Dosha*, *Sthanam*) mechanism of diagnosis. According to this concept *Dosha* vitiates in body and causes suppression of *Agni*, which further lead to formation of *Aama*. This *Aama* and vitiated *Dosha* settle in various settlements in body causes various pathologies. This concept beautifully depicts the pathology in *Ayurveda* but unanswerable in modern terms.[31] Their understanding in modern terms is required to process new investigation modules in *Ayurveda*.

Aama is a broad concept in *Ayurveda* and represent the working dynamics in body. Its direct correlation with any single mechanism or metabolic pathway is not possible. Still for further advancement in biotechnological aspect of *Ayurveda* some mechanisms are picked up as a part of *Aama* to evaluate and developing new technologies. Imbalance in gut biota is primarily associated with break in metabolic pathway. Decrease in quantity of good gut bacteria like provitella, bifidobacteria, fumingatus etc. lead to disruption of various metabolic chains, most importantly cycles of SCFAs, tryptophan, TREG mechanism and bile acids. Short chain fatty acids are fatty acids contain 4-6 carbon atoms in them. Some important SCFAs are butyrate, propionate and acetate. Due to imbalance in gut microbiota, SCFAs like butyrate does not form properly and are responsible for formation of improper inflammatory compounds, decrease IgG, IgA and IgE secretions and polarize M2. There are different roles of SCFAs according to different diseases mentioned above. Gut biota is also responsible for conversion of tryptophan into IDA (indole derivatives), it further enhances immune function and decrease inflammatory processes. Gut biota metabolises function of bile acids, this kind of pathology can be seen in IDA (iron efficiency anaemia), jaundice and other diseases.

Conclusion

This study on *Aama* and dysbiosis is small sized but first of its kind in field of Ayurveda. Various diseases are studied to derive a direct relation between *Aama* in Ayurveda and dysbiosis in modern science. During study it is seen that all the diseases in modern are linked to a common channel that is break in metabolic pathway. This break in metabolic pathway is due to abolishing gut biota. It leads to various inflammatory, metabolic and immune related reactions. A similar concept is seen in *Ayurveda* in form of *Agni-Mandhya* and *Aama*. Any disease that begins within the body certainly have above mentioned pathological state. Through thorough study and statistical analysis, both of the concepts are found to be similar in nature. That's why it is concluded that *Aama* and dysbiosis are related concept. This research doesn't claim that *Aama* is same as dysbiosis, but dysbiosis is somewhere related with *Aama*. Further studies on the topic will enhance our understanding toward biotechnical studies in *Ayurveda*.

- Main aim of this study is to set a parameter that can be used to find broken metabolic pathways in

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terms of *Ayurveda*. This way can open a passage for biotechnological advancement in *Ayurveda*. If further studies support the concept, we have a better chance to develop biotech on the grounds of bio dynamics as well as gross microscopic examinations.

- Future interoception of this study is extremely important as further studies on the topic will reveal the detailed mechanism of every single disease and will help in investigating *Ayurveda* in more expressible terms.
- Once the understanding of *Aama* is clear we can seek for some investigating model from the concept, to strengthen the concept of investigating tools in *Ayurveda*.
- Further researches in the area will help in establishing concept of bio-dynamics rather than gross looking under microscopes.
- Similar studies in future can be useful to minimize the role of antibiotics. As resistance development and damaging gut biota are the two essential problems associated with antibiotics, so minimizing its use and maximising *Ayurveda* approach for treatment can influence health sector in positive dimension.

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