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Evidence and Scope of Statistics in Ayurveda

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ABSTRACT

Statistics is a form of applied mathematics, in general sense statistics refers to the information we get from data. Data or numbers are all around us and if we make the data mean something it becomes more useful to us. Statistical methods and analysis are often used to communicate research findings and to support hypotheses and give credibility to research methodology and conclusions. Ayurveda, a medical science developed in India as other various ancient sciences based on the simple concept of hetu, linga and oushadha. Various methods like observing the nature, behaviour of animal and similarities in feature where observed, data was collected and conformation of their health benefits are the evidence where statistics was part as a tool to develop this science competent to compete with the modern world challenges. Statistics can be applied and this has a wide scope in many Ayurvedic research works such as in literary research, clinical research, pharmacological research, observational study, survey study etc. Standardization of the variables or charts for assessing concepts like *Dosha, Dhatu, Prakruti, Agni, Ama, Bala* etc. will help Ayurvedic scholars to get accurate results and hence global acceptance of Ayurveda as an authentic science. Use of modern statistical tools and theories will revalidate the earlier observations.

Key words: *Ayurveda, Evidence, Statistics.*

INTRODUCTION

The word statistics is derived from Latin word status,[1] Italian word statista, German word statistic. All these words refer to a political state which is because of reasons that the knowledge of statistics was used to run a state / Kingdom / country. Sankhya shastra was part and parcel in the growth and establishment of all civilization on earth. Every civilization has their contributions to the present-day forms of knowledge, along with the influence on growth and development of science also. India has its important contribution through its *Ganita Shastra*. In Ayurveda direct mentioning of *Sankya Syaad Ganitam*[2] refers to mathematics. In Charaka Samhita, direct mentioning of the word *Sankya* in the context where *Paraadi Guna's* and its *Prakarana* is explained.

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AYURVEDA AND STATISTICS

Ayurveda, a medical science developed in India as other various ancient sciences based on the simple concept of *Hetu, Linga* and *Oushadha*. Various methods like observing the nature, behaviour of animals similarities in feature, where observation, data collection and confirming there health benefits are the evidence where statistics was part as atool to develop this science competent to compete with the modern world challenges.

AIM AND OBJECTIVES

Evidence and scope of application of statistics in the field of Ayurveda (research field)

MATERIALS

Brhatrayees, other authentic statistic text books

ISSN: 2456-3110 REVIEW ARTICLE Mar-Apr 2020

METHODS

Collection, compiling, analysing concepts of Ayurveda which highlights the relevance of statistics mainly application in the field of Ayurveda (research).

Is Statistics, a synonym for Vimana?

In Vimanasthana of Charaka Samhita we have the definition stating *'Visheshena Meeyatay Gnyayatay Dosha Bheshajadi Anina Eti Vimanam'*[3] where *Visheshena* means specific or special knowledge, *Meeyate* means to gain knowledge andaccording to *Amarakosha* meaning measurements and *Gnyayatay* meaning a precise and perfect knowledge, hence considered here as a synonym.

Statisticsis a form of applied mathematics, in general sense statistics refers to the information we get from data.[4] Data or numbers are all around us and if we make the data mean something it becomes more useful to us. Statistical methods and analysis are often used to communicate research findings and to support hypotheses and give credibility to research methodology and conclusions.

The word statistics is used in two different ways in plural noun and singular noun. In plural nounmeaning collection of numerical information and deals with only numbering. In this regard all *Bruhatrayees*, particularly in Charaka Samhita, numerical values to represent data are explained for example to denote *Panchamahabhutas, Saptadhatus, Panchakarma, Astamaha Gada, Trividharoga Marga* etc. In singular noun meaning science of collecting, classifying, presentation, analysis and interpreting data related to any sphere of enquiry[5] mainly deals with method to make inference and draw conclusions from numerical data for example in *Dravya Sangrahaniya Adhyaya* of *Susruta Samhita* the different *Ganas* (collection of medicinal plants) like *Salasaradi Gana, Argvadhadi Gana* are explained where drugs with similarity in actions are grouped.[6]

Coming to the branches of statistics mainly descriptive statistics and inferential statistics. Descriptive mainly describes the data collected, from this type of statistics, we cannot draw conclusions but this can be utilized to nutshell or to summarize a huge data in a meaningful way; in Charaka Samhita numerical values have been given importance and also used to summarize the huge data in a meaning full way as very evident specially in Sutrasthana very first chapter of Charaka Samhita and Ashatanga Hridaya summarises whole content and objective of the book, Trividha Hetu Sangraha encapsulates the data of causative factors for a disease to occur. Inferential statistics mainly aims to make inferences from the data in order to make conclusions beyond data, coming to it as a science of collecting, classifying, presentation, analysis and interpreting data we can consider the following mentioning of only *Shadrasas* - shows the importance and role of numbering to describe and for a clear understanding of the data, and inferring to conclude on the order mentioned for *Madhura* being liked by all hence mentioned 1st, Similarly inferring *Sarpi* as best among the 4 *Mahasnehas*, another evidence mentioning in *Mana Paribhasha* - Charakas Pautava Mana starts from *Vamsi* and following been mentioned in increasing order of increasing size.

COMMON STATISTICAL TERMS AND ITS RELEVANCE IN AYURVEDA

Branches of Statistics

Descriptive statistics

It simply means a way to describe the data collected. In *Charaka Samhita* numerical values have been given importance and also used to summarize the huge data in a meaning full way as very evident specially in Sutrasthana. For example, in the first chapter of Charaka Samhita and Ashtanga Hridaya summarises whole content and objective of the book, from this we can infer on how it's been summarizes on what Ayurveda deals with in a sentence where *Manam* word mentioned highlights the importance of use of numerical values. The whole 19th chapter of Charaka Samhita i.e. *Asthoudariya Adhyaya* is based on numbering and also counts on summarizing the huge data i.e. *Astoumutraghata, Saptakusthani* etc. are mentioned.[7]

ISSN: 2456-3110 REVIEW ARTICLE Mar-Apr 2020

Inferential statistics

Aims to make inferences from the data in order to make conclusions beyond data. Here collecting, classifying, presentation, analysis and interpreting data can be considered. In Charaka Samhita *'Shatak Iti Punaha Sankhyakaranam'*[8] shows the importance and role of numbering to describe and for a clear understanding of the data.

Analysis, Interpreting Data and Finally a Conclusion - The types of numbering and fixing the preference is an outcome of scientific deliberation that took place based on the data available. For example Conclusion as two *Virya* only, *Trividha Dhatu Poshana Nyaya*, three *Vipakaas*.[9]

Data - refers to a given piece of information; it is of 2 types

- **Qualitative data** i.e. information about qualities eg concept of guna's each guna is attributed to specific quality like guru guna with brumhana property.
- **Quantitative data** i.e. information that can be measured and written down in numbers eg. reference from the chapter *Shareera Sankhya Shareeram* are evident of measurement in numbers.

Collection of data

The process of gathering information also referring to source of information, eg. gaining knowledge of plants, its utility, recognition etc. one should go to vanavasi etc. and gain information from them, *Roga* and *Rogi Pariksa Vidhi* is tool to collect data.

Classification of data

The process of organizing data into groups or classes according to some common characteristics present in the data eg. mentioning of various *Mahakashaya Jeevaniya*[10] etc. where drugs with similar actions are grouped together, the classification of *Prakruti* based on *Doshas* i.e. *Vatala* etc.

Presentation of data

Systematic representation of data. Mainly 3 ways textual, tabulation or graphical presentation. The data was gathered and presented in a typical method in those days. Presentation of the *Samhitas* in various *Adhyayas* i.e. *Sutrasthana, Nidanasthana* etc. even numbering of each *Slokas* and giving *Adhyaya* numbers emphasizes on systematic representation of data.

Analysis of data

The method of transforming and remodulation of the data. The commentaries written by various *Acharyas* over the *Samhitas* can be considered here.

In Samhitas Slokas written by *Agnivesha, Charaka* is clearly analyzed by *Chakrapanidutta* and any indirect or hidden and contextual meaning if present, is mentioned.

Interpretation of data

Process of approaching towards the conclusion regarding the analyzed data.

In *Atreyabhadrakapya Adhyaya* of Charaka Samhita, regarding the types of *Rasa* there were different opinions finally considering all the information and discussion, Acharya concludes that *Rasa* is of 6 types.

Each and every chapter of the *Samhita* ends with *Bhavanti Cha Atra* followed by a few verses which will be intended upon conclusion of the particular chapter.

Mean

In simple words mean means average.

In *Asthanga Hrudaya* one *Bindu* is considered as average quantity of fluid that drops down when an individual lift the *Pradeshinya Anguli* which is dipped in fluid.[11]

Median

The middle value or considered one that divides the data into 2 equal halves.

While explaining *Dasha Vidha Pariksha* classification of *Satva, Sara, Samhanana* etc. are *Avara*, *Madhyama* - middle value and *Pravara*.

Mode

The most frequently occurring /common, or usual.

ISSN: 2456-3110 REVIEW ARTICLE Mar-Apr 2020

In the context of *Desha* it is mentioned *Jangalam Vata Buyistham,* meaning *Jangala Desha* people commonly suffer from *Vata Vyadhis* and *Kapha Vyadhis* in *Anupadesha*.

The mentioning of *Chatrino Gachyanti Nyaya* in Charaka, meaning when we observe a group of people holding umbrellas even in between if 1-2 don't have an umbrella it is commonly understood and seems like they have an umbrella.[12]

DISCUSSION

Different fields in statistics and its application and relevance in Ayurveda

Environmental Statistics - Utility of statistical methods in environmental science. Applied in knowledge of climate, air and water quality are included. It also encompasses soil sciences, vegetation cover, agriculture and land use.

Classical evidence of environmental statistics can be related in the following explanations like *Trividha Dravyabheda* (*Janghama*, *Parthriva* and *Oudhbhida*). In Sushruta even the qualities of soil are been mentioned which shows relevance of awareness of this knowledge. *Oushada Sangraha Kala* where collection of specific plant parts in specific seasons have been mentioned.

Epidemiology - Study of factors effecting the health and illness of populations and serves as the foundation and logic of interventions made in the interest of public health and prevent medicines. The concept of *Janapadaudwamsa* where *Acharya* highlights *Vayu, Udaka, Desha, Kala* as factors effecting people in large numbers. Even the *Lakshana's* of vitiation of each factors are explained along with measures to prevent the diseases and their treatments.

Health statistics - Covers the entire gamut of health sciences, applied mainly in the concept of Curative, promotive and preventive Sciences. Detail explanation on *Dinacharya* and *Ritucharya* where impact of different *Ritus* on every individual and its prevention, methods to be adopted by individual/by mass are explained. *Rasayana* concept are explained in classics can be considered for understanding the promotive concept of health. *Vajeekarana* as science developed for *Supraja*, having a child without any diseases may be preventing possible genetic disorders.

Medical statistics - Utility in the medical field / medicine, applied mainly to know about drug therapy, disease pattern in a particular disease. Classically the concept of *Trisutra, Nidana Panchakas, Asthavidha* and *Dashavidha Pareeksha.* Based on these, diagnosis is done and Various *Chikitsa Siddhanta, Chiktsa Sutra* and *Chikitsa* modalities and suitable *Oushadhi* are developed.

Application of Statistics in diagnosis

For Rogi Bala Pramana Jnanarth - There is a provision for counting the number of +ve characters concerned to respective features and observing the % of these to decide *Pravarata*, *Madhyama* and *Avara Balata* of *Prakriti, Sara,* etc. For *Roga Bala Pramana Jnanartha* - number of *Nidana*, *Poorvaroopa*, etc. Assessment of *Samyak Lakshana* of *Dosha, Dhatu* and *Mala* before and after treatment based these *Chikitsa Siddhanta, Chikitsa Sutra* are formed.

Vital statistics - Refers to an data that gives information regarding vital events / events that mark life ie births, deaths, migration etc. Mentioning of *Kala* and *Akala Mrutyu.* In the chapter *Janapadaudhwamsaniya Vimana* number of people exposed to diseases and number of people falling ill is mentioned. After verifying the events following are named as dasha *Pranayatana*, *Trimarma, Marma Sthana, Arista Lakshana.*

Relevance and scope of application of statistics in Ayurveda (research field)

Statistics can be applied in many Ayurvedic research works such as in literary research, clinical research, pharmacological research, observational study, survey study etc.[13]

In **literary research** is nothing but to study, evaluate and interpretation of literature. For example, for a disease all the *Lakshanas* can be collected from various *Samhitas* can belisted and compared to see which signs and symptoms are mentioned by all

ISSN: 2456-3110 REVIEW ARTICLE Mar-Apr 2020

Acharyas and these can be documented as the cardinal symptoms of that disease further helping in diagnosis of a specific disease.

In **clinical research,** There are plenty of evidences where comparative efficacy of various *Chikitsa* modalities and medicines are mentioned for example - *Mustadi Yapana* is *Sadhya Jwaranashani*, Efficacy of *Eranda* in *Amavata*, Role of *Basti* in *Vatarakta*. Thus this indicates that there were comparative clinical studies. Considering the scope in research all the information above can be applied involving human volunteers.

In our classics mentioning of the *Agraoushadhies* i.e. a specific drug in a particular disease was studied and concluded to be the best. In **Pharmacological research**, there is a wide scope of study of drug action. What changes it exerts either biochemical or physiological effect on the cell, tissue, organ or organism which in turn shows action on a specific disease can be researched.

Time to time new diseases are observed**,** in **observational study,** the newer diseases present like dengue etc. can be carefully observed, correlated and treatments can be framed accordingly.

When people started suffering in larger numbers our *Acharyas* probably had done a survey and mentioned only the factors like *Vayu, Udaka, Desha* etc. mentioned in *Janapadaudhwamsa* of Charaka Samhita, so as to be a reason to cause diseases in larger number. Considering in survey studies, various surveys can be done for example Rasaoushadhies are blamed for causing toxic effects, a survey can be made to analyze on the blood parameters and hence conclusions can be drawn.

All the information gained from the litrary, pharmacological field can be utilized and planning of clinical trials based on these informations whould be more fruitful for the science. At an institutional level in Ayurveda all the fields are to go hand in hand for the development of the science. To assess, manage and plan the community health. And also make the government or policy makers to take the note on Ayurvedic concepts, principles in maintenance, sustenance and enhancement of health of an individual or population can be brought forth.

Conclusion

The thorough understanding of Ayurvedic texts reveals that statistical methods were used during those times. Though the tools were different, the concepts and approach were same. Standardization of the variables or charts for assessing concepts like *Dosha, Dhatu, Prakruti, Agni, Bala* etc. will help Ayurvedic scholars to get accurate results and hence Ayurveda can be globally accepted as an authentic science**.** Use of modern statistical tools and theories will revalidate the earlier observations.

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ISSN: 2456-3110 **REVIEW ARTICLE** Mar-Apr 2020

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