Review Article

Tantraguna – The ancient criteria for scientific writing

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Abstract

The scientific paper has been developed over the past three centuries into a tool to communicate the results of scientific inquiry. Scientific writing must have of a high standard because it is related with the process of gaining knowledge for the learned as well as new learners. In ancient era, specific writing methodology was adopted by the scientists to prepare standard and highly-scientific manuscripts in the field. Tools such as *Tantrayukti* (techniques for writing/decoding treatise), *Tachchhilya* (inclinations), *Kalpana* (compositions), etc., have been described in the classics to maintain the quality standards of scientific literature. Due to well-established writing methods, scientific literatures such as *Samhita* (Ayurvedic texts), *Samgraha-grantha* (compendia), *Nighantu* (lexicons), etc., were written uniformly and good quality literature was generated. The characteristics of good scientific writing for *Shastra* (treatise) have been described in the *Vimanasthana* of *Charaka Samhita* which is known as *Tantraguna*. The *Tantraguna* covers the key points of the writing such as language, order, length, method, etc. After reviewing and analyzing these *Tantraguna*, it can be concluded that the ancient writing method can be compared with some aspect to current introduction, methods, results and discussion structure of scientific writing. This analysis may help to empower and strengthen the current standards of scientific writing by editing new aspects of ancient writing method.

Keywords: *Charaka Samhita, Tantraguna, Vimanasthana*

Introduction

Writing is a very important part of science; it is used to document and communicate ideas, activities and findings to others. Scientific writing can take many forms from a laboratory notebook to a project report and from a paper in an academic journal to an article in a scientific magazine.[1] Good writing requires as much care and thought as the experiments or researches that are carried out. Writing a research paper or review article or text for medical science is not a simple task. Nowadays, as research is essential for every field of science, its writing method requires uniformity in its presentation for clear communication. Scientific papers must be written clearly and concisely so that readers with background similar to the author can understand easily what he had done and how he had done. Currently, many guidelines are available for scientific writing but introduction, methods, results and discussion (IMRAD) structure[2] is more scientific and popular in scientist community. While writing a research article, only facts should be mentioned with evidence which should be based on careful observations. However, in literary research, hypothetical writing may be permissible but again it must be supported with strong and authentic classical references or carefully collected genuine large data. Structure, style, language, and overall presentation of thoughts are also some of the important aspects to be considered for writing a good quality paper.

In ancient era, literatures of various fields have been written in Samskrit language. Further, similarity in writing methods of texts of each field suggested that uniform writing methodology was adopted by the ancient scientists to prepare standard and highly-scientific manuscripts. Details of such methodology are found in *Charaka Samhita*, one of the textbooks of ancient medical science. Author of the text, *Acharya Charaka* described writing methodology while explaining the selection criteria for high-quality manuscript to a new scholar.[3] In this critical review, *Tantraguna* have been compiled from *Charaka Samhita*; further, it was interpreted and compared with current tools of the scientific writing.

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Tantraguna: The Characteristics of Good Scientific Writing

Tantraguna have been described in 8th chapter of *Vimanasthana* of *Charaka Samhita*. "*Vimanasthana"* section was written for the quantitative determination of the specific attributes of treatment such as *Rasa*, *Dravya*, *Dosha* and *Vikara*.[4] The eighth chapter of *Vimanasthana* deals with the determination of the specific requirements for the treatment of diseases.[5] In the beginning of the chapter, scholars are advised for the selection of a standard medical text with good writing. To facilitate the selection, *Acharya Charaka* described the characteristics of good scientific writing which are elaborated as *Tantraguna*. Each and every *Tantraguna is* furnished and interpreted as follows.

Sumahat (well comprehensive)

Writing should be comprehensive. It should cover all the necessary aspects of the topic. Here, it is also to be kept in mind that according to the format of the article, length may be decided. On the length of the manuscript, *Vriddha Vagbhatta* opines that it should neither too lengthy nor too short.[6] This may be a criterion for research article or scientific paper, or a book; author should cover all the aspects with essential details.

Yashasvi-Dheera-Purusha-Sevita and *Apta-pujita* (accepted by scientific fraternity)

Text which is being used by qualified, experienced persons of the same field should be considered authentic. This characteristic indicates that the subject of text should be popular in scientific community and its applicability and acceptability of knowledge in common practice is high.

Arthabahulam (well interpreted)

The writing should reveal broad and accurate interpretations by a limited number of words. The content of the subject should be concise and immensely meaningful. For composition of concise and precise matter, ancient authors of Ayurveda used some methodology to facilitate easy transmission, equally beneficial for all. The meanings underlying the text are to be interpreted with due regards to the principles of elaboration (*Nirdesha*) and reduction (*Uddesha*).[7]

Trividha Shishya Buddhihitam (clearly expressed)

Literary meaning of this feature is that the treatise should be equally suitable for the understanding of three categories of students, i.e. highly intelligent, moderate and low. It indicates that scientific paper should be clearly expressed, easily understandable and appealable to all types of persons related to particular field i.e. from highly intellectuals to normal.

Apagata Punarukta Dosha (no repetition of content or without plagiarism)

Scientific writing should be free from repetition of the subject. Hence, repetition of subject in same or different sentences in paper resulting in increase of the number of pages is considered as low quality of work. "*Punarukta Dosha"* may also indicate toward plagiarism. Using other researchers' ideas or any parts of their writing as your own is a serious offence known as plagiarism. Thus, *Tantraguna* also suggests that data mentioned in the study should not be copied from earlier research works.

Aarsha (unbiased)

Study should be conducted and reviewed by unbiased, genuine, and scientific person. Bias[8] may be raised from any conflict of interest in experiments or by study conducted through nonscientific methods. Both kinds of bias lead to the generation of false and unscientific data. Hence, scholar should be well equipped with thorough knowledge of respective field and should not have any conflict.

Supranita Sootra-Bhashya-Samgraha Krama (well-structured and in good format)

This feature describes the well-knit format of the writing. Literary meaning of this characteristic is intended for treatise in order of aphorism, commentary and orderly collection. The word *Sootra* denotes the literary view in a concise form[9] which should be written as an initial part of manuscript and it can be correlated with phenomenon or theory under investigation of paper which may be reflected in title of the paper**.** Title always should reflect the key feature of the paper. *Bhashya* means detailed explanation[10] of subject which includes introduction, material and method, results and discussion. *Samgraha* formally means collection of the described matter in compact form at the last part of the text which resembles with the conclusion or summary of study. Scientific paper always should be ended with some definite conclusions. The entire work should be in proper arrangement of abstract, detailed description and conclusion. These characteristic represents the current popular format of scientific writing, i.e., IMRAD structure.

Swadharam (well authenticated)

Statements and ideas are supported by appropriate evidence that demonstrates how conclusions have been drawn as well as acknowledging the work of others. Author should present *Adhara,* i.e., authentic reference or scientific data for every argument or every description. Facts should be supported by figures. Thus, this quality indicates that proper referencing style is also an important characteristic of good scientific writing. Currently, Vancouver and Harvard style of referencing[11] are more popular in scientific fraternity. One should always keep it in mind that authenticated materials, equipment, methods, procedure, primary data, and statistical analysis can only provide scientific validity.

Anavapatita Shabda – Akashta Shabda (without vague and ambiguous language)

Scientific writing should be devoid of words which are of cheap expression and/or difficult to pronounce and understand. In other words, it should be in simple, technical and scientific terms. Such kind of words may be used which can be understandable by a normal technical person of the field. Words used should point out the definite meaning and should not create any confusion to the reader.

Pushkalabhidhanam (having abundant expression)

The script should be abundant with synonyms which are having wider application.

Arthatatvavinishchayapradhanam (focused on determination of objectives)

Scientific writing should emphasize the determination of the central idea of the matter. It should deal with the topic of the writing only and should not describe irrelevant subjects and it should be without controversies. *VriddhaVagbhata* has specified this quality in other words, i.e., "*Swanya Tantra Virodhanam Bhooyishtam Vinivartakah*". This means that his text solves all the controversies among the texts of the subject. Scientific paper should try to answer all the controversies prevailing regarding topic under discussion and it should not create a new problem or controversy' which supports this issue.[12]

Asankulaprakaranam (without complexity or amalgamation of subject)

Chapters of scientific work should not be intermingled. A science dealing with a specific subject in totality concerning all the existing aspects of that subject, is desirable to be divided and arranged with some technique, some methodology to convey and present its contents in precise and concise form with lucidity.

Aashuprabodhakam (transparent or crystal clear)

This means that writing should be uncomplicated, quick and easy to get conveyed. The topic, the language and overall structure of the writing should be explicit which can be understood quickly and easily.

Lakshanavat, Udaharanavat (with good qualities and examples)

The work should provide scientific definitions, captions etc. In addition, scientific writing should be based or equipped with sufficient and appropriate examples or illustrations.

Discussion

Currently, the term IMRAD has become the choice of most of the research journals. In IMRAD format, introduction explains the scope and objective of the study in the light of current knowledge on the subject; the materials and methods describes how the study was conducted and which tools have been used to obtain data; the results section reports what was found in the study and the discussion section explains meaning and significance of the results and provides suggestions for the future directions of research.[13] Before IMRAD format, introduction, body and conclusion (IBC) format was used for all academic writing. IMRAD format is simply a more defined version of the "IBC."[14]

In ancient era, the scientific literature was also written in a specific sequential step, i.e., "*Sootra*" initially, followed by "*Bhashya*" and "*Samgraha*." First step, *Sootra* which means a theorem condensed in few words.[15] A "*Sootra"* is a phenomenon stated succinctly. *Sootra* should be written initially in paper that reflects the core idea of paper. In contemporary scientific writing, titles are written in three ways such as declarative title, descriptive title, and interrogative title.[16] Among these, declarative title explains "what papers say, not just what they cover" i.e., their main "conclusions" and *Sootra* also indicates the same. Hence, *Sootra* can be compared with "declarative title" of the contemporary scientific writing.

The second step, *Bhashya,* literary, it refers to "exposition" or "explanation" or"commentary" that brings light to something else.[17] *Bhashya* explains all the aspects of the *Sootra* (theorem or phenomenon condensed) in detail.[18] In other words, *Bhashya* may explain that how the "*Sootra"* (theory) was made, rationality behind the declared "*Sootra*," how it was evaluated or examined. Each and every angle related to the topic/idea/theory is described in this part. Thus, *Bhashya* phase may cover the introduction, methods and results with discussion parts of the study.

Third step, *Samgraha* means the act or process of compiling or gathering together. Salient features of the study are mentioned in this part. Thus, "conclusion or summary" may resemble to"*Samgraha*" phase. This analysis indicates that ancient scientific writing narrated in three phases, i.e., *Sootra* (Declarative Title), *Bhashya* (Explanation) and *Samgraha* (summary or conclusion) may resemble to earlier format of IMRAD, i.e., IBC.

The IMRAD structure has proved successful because it facilitates literature review, allowing readers to navigate articles more quickly to locate material relevant to their purpose.[19] The IMRAD structure effectively supports a reordering that eliminates unnecessary detail and allows the reader to assess a well-ordered and noise-free presentation of the relevant and significant information. Here, word noise indicates large amount of irrelevant and meaningless information which is collected at the time of data collection. It allows the most relevant information to be presented clearly and logically to the readership, by summarizing the research process in an ideal sequence and without unnecessary detail.[20] The IMRAD structure has been criticized for being too rigid and simplistic and not giving a realistic representation of the thought processes of the scientist. It was believed that many students and faculty treat the structure as a simple panacea.[21]

Tantraguna covers the key points of the writing such as language, order, length, method, etc. These characteristics can be utilized to generate new guideline to evaluate and categorize the Ayurveda literature writing. In any scientific writing, after having considered all factors and from various perspectives, one can formulate his opinion on the basis of *Tarka* (logic), *Yukti* (strategy), and *Udaharana* (example) with regard to the correct nature of object or subject under discussion with the proper line of action.[22]

Conclusion

Tantraguna was designed as an ancient guideline to select textbook for study purpose in conventional education system. This methodology was also followed by subsequent author of Ayurveda texts, compendia and lexicons. As a result, voluminous literature of high standard was produced and made available to Ayurveda fraternity of modern era. *Tantraguna* shows precise characteristic of good scientific writing of ancient literature of any field. It suggested that good scientific writing should be clear, simple, impartial, structured logically, accurate and objective. A critical analysis of *Tantraguna* indicates that it is more or less similar with current popular guideline, i.e. IMRAD structure. Constructive amalgamation of ancient and current guideline may serve as ideal criteria for scientific writing.

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Conflicts of interest

There are no conflicts of interest.

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हिन्दी सारांश

तंत्रगुण – वैज्ञानिक लेख के प्राचीन मानदंड

हितेश व्यास

वैज्ञानिक शोधपत्र विगत तीन शताब्दियों से वैज्ञानिक अनुसंधान के परिणाम सूचित करने के साधन के रूप में विकसित हुआ है। वैज्ञानिक लेखन में एक उच्च मानक होना आवश्यक है क्योंकि यह वरिष्ठ एवं नए विद्यार्थी दोनों के लिए ज्ञान प्राप्त करने की प्रक्रिया से संबंधित है। प्राचीन काल में, वैज्ञानिकों द्वारा प्रत्येक क्षेत्र में मानक तथा उच्च स्तरीय वैज्ञानिक पांडुलिपि तैयार करने के लिए विशिष्ट लेखन पद्धति अपनाई गई थी। वैज्ञानिक साहित्य के गुणवत्ता मानकों को बनाए रखने के लिए शास्त्रों में तंत्रयुक्ति(ग्रंथ लिखने अथवा गूढ़ार्थों को सुलझाने की तकनीकें), ताच्छिल्य(समानता/ हठ), कल्पना(नवीन रचनाएँ) इत्यादि जैसे पद्धति का वर्णन किया गया है। सुस्थापित लेखन पद्धति के कारण, संहिताएँ, संग्रह ग्रन्थ, निघंटु इत्यादि वैज्ञानिक साहित्य समरूप से लिखे गए थे और इस कारण उच्च गुणवत्ता वाले साहित्य का निर्माण प्राचीन काल में हुआ । शास्त्र निर्माण के सन्दर्भ में उच्च वैज्ञानिक लेखन की विशेषताओं को चरक संहिता के विमान स्थान में तन्त्रगुण के अंतर्गत वर्णित किया गया है। तंत्रगुण के अंतर्गत वैज्ञानिक लेख के महत्वपूर्ण तथ्य जैसे भाषा, क्रम, विस्तार, विधि आदि का समावेश हो जाता है। इन तंत्रगुण की समीक्षा और विश्लेषण करने के बाद, यह निष्कर्ष निकाला जा सकता है कि प्राचीन लेखन पद्धति की तुलना वैज्ञानिक शोधपत्र लेखन के वर्तमान कालीन आई एम आर ए डी संरचना के कुछ पहलुओं से की जा सकती है। यह विश्लेषण प्राचीन लेखन पद्धति के नए पक्ष को संपादित करके वैज्ञानिक लेखन के वर्तमान मानकों को सशक्त करने में मदद कर सकता है।