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trn:oid::1:3207689844

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IJAR-50925.docx

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A comprehensive discernment of the pathogenesis of atherosclerosis based on the Gurvadi Guna

Abstract:

Pure science is one academic discipline that derives new knowledge from scientific experiments. This includes Physics, Chemistry and Biology. The main goal of pure science is to develop theories that establish the relations between the phenomena of the universe. These developed theories possess some properties or Guna through which one can understand the concepts. As explained by Ayurveda, Guna (Properties) is one among the Shadpadartha (Six Padarthas). Ayurveda accepts 41 properties, of which 20 are the Gurvadi Guna (Heaviness, etc). This Gurvadi Guna has a major role in clinical practice, especially in the manifestation of Vyadhi (Disease) and the Chikitsa (Treatment). Atherosclerosis is a disease where arteries change their properties due to the deposition of Fats and cholesterols in their walls. Understanding the process of manifestation of the disease is given prime importance in Ayurveda to treat it. Hence one should understand the pathogenesis at the Guna level to plan the proper treatment. Basic concepts of pure science and Gurvadi Guna having similar actions are compared and an attempt is made to establish the relationship between Gurvadi Guna and basic concepts of pure science in the manifestation of atherosclerosis. Guna is inferred through the Karma (Action). Most of the basic concepts of pure science are the measuring parameters that have their properties in causing the action. Discerning atherosclerosis through the basic concepts of pure science is the stepping stone to the plan of treatment protocols based on the Gurvadi Guna.

Keywords: Gurvadi Guna, Basic Concepts, Pure Science, Atherosclerosis.

Introduction:

Pure science is one academic discipline that derives new knowledge from scientific experiments. This includes Physics, Chemistry and Biology. Physics deals with fundamental principles of nature including motion, forces, waves and energy. Chemistry focuses on the composition, structure, and reactions of the elements. Biology involves the study of living organisms, their structure, function, and growth etc. The main goal of pure science is developing the theories establishing the relations between the phenomena of the universe. These developed theories possess some properties through which one can understand the concepts. Guna (Properties) is one among the Shadpadartha (Six Padarthas) explained in Ayurveda. Ayurveda accepts 41 Guna. Namely 5 Vishesha Guna, 20 Gurvadi Guna, 6 Atma Guna and 10 Paradi Guna.^[1] These Vimshati Gurvadi Guna (Heaviness etc 20 properties) are called Sharira Guna (Properties related to the body) which helps in understanding the physiology as well as the pathology of the body.^[2] Atherosclerosis is one such disease where arteries change their properties due to the deposition of Fats and cholesterols in their walls. Understanding the process of manifestation of the disease is given prime importance in Ayurveda to treat it. Hence one should discern the pathogenesis at the Guna level to plan the proper Chikitsa (Treatment).

Need for the study:

Gurvadi Guna are essential in understanding disease pathogenesis by analysing how substances influence the body's mechanism. When it is integrated with basic science, these

Guna fit in the principles of basic science as well. Understanding these properties enables targeted dietary and lifestyle modifications in lifestyle disorders, promoting balance and preventing diseases. In today's era of atherosclerosis, this approach bridges traditional wisdom with scientific insights. It supports not only symptom management but also addresses the root causes of the diseases. Thus, Gurvadi Guna remains a tool for holistic and preventive healthcare. Hence for the proper diagnosis and effective treatment along with the preventive perspective of the disease, understanding the concept of Gurvadi Guna is essential.

Aims and Objectives:

- To understand the pathogenesis of atherosclerosis through the concept of Gurvadi Guna and concepts of pure science.

Sources of information:

A comprehensive literature research was conducted to gather information from different resources. The review was carried out using classical and contemporary texts such as Charaka Samhita, Sushruta Samhita and Ashtanga Hridaya, Text Book of Padartha Vijnana evam Ayurveda Itihasa, Padartha Jijnasa, Textbook of Pathology and various peer-reviewed journals and Websites.

Methodology:

- Step 1: Information regarding the fundamental principles of pure science is collected.
- Step 2: Literatures available on the Gurvadi Guna are compiled from Ayurveda texts.
- Step 3: Causes and Pathogenesis of the atherosclerosis is reviewed from the Textbooks of pathology and various peer reviewed journals.
- Step 4: A comparison of the Gurvadi Guna with concepts of pure science is carried out.

- Step 5: Gurvadi Guna and concepts of pure science are analysed in discerning the pathogenesis of atherosclerosis.

Review of Literature:

2 Pure science is also known as Basic science or Fundamental science which deals with the study of natural phenomena through observation, and experimentation using scientific methods to establish theories. It helps to understand the universe through scientific experiments. Physics, Chemistry, and Biology are some examples of pure science. The main goal of pure science is to gain knowledge in a particular field regardless of how it is ultimately used. Pure science widens the understanding of the phenomenon in the scientific field by creating curiosity about the properties of the concepts.^[3]

Guna or the attributes are one among the Shadkarana (Six reasons) explained in Ayurveda. It is the base of the selection of a drug or food. Hence it is mentioned after the Dravya(Object).^[4] That which attracts is called Guna.^[5] Vaisheshika Darshana defines the Guna as that which resides in the Dravya expecting Karma (Action) to happen and itself having no Guna. Gurvadi Guna are obtained from the Parthivadi Dravya (Earth etc 5 basic elements) which mainly focuses on the physical properties of the substances found in the body and around.^[6] Inferences of these 20 Guna are possible through their action by the Dravya.^[7] Hence understanding the physiology as well as the pathology of the body from the perspective of Gurvadi Guna has a major role in planning the treatment. These Twenty Guna are also called Dwandwa Guna as their actions are opposite to one another.^[8] Guna and their Karma are given as mentioned in Table 1.

Table 1: 20 Gurvadi Guna with their Karma^[9]

Sl. No.	Guna	Karma
1	Guru (Heavy)	Brimhana (Nourishing)
	Laghu (Light)	Langhana (Depleting)
2	Manda(Slow)	Shamana(Palliating)
	Teekshna(Fast)	Shodhana(Purification)
3	Hima(Cold)	Stambhana(Stasis)
	Ushna(Hot)	Swedana(Sudation)
4	Snigdha(Unctuous)	Keldana(Moistening)
	Rooksha(Dry)	Shoshana(Dries)
5	Shlakshna(Smooth)	Ropana(Healing)
	Khara(Rough)	Lekhana(Scraping)
6	Sandra(Concentrated)	Prasadana(Gathering)
	Drava(Diluted)	Vilodana(Spreading)
7	Mridu(Soft)	Shlathana(loosening)
	Kathina(Hard)	Drideekarana(Compactness)
8	Sthira(Stable)	Dharana(Capacity of bearing)
	Sara(Mobile)	Prerana(Propagating)
9	Sookshma(Minute)	Vivarana(Capacity to open)

	Sthoola(Gross)	Samvarana(Obliterates the channels)
10	Vishada(Clear) Picchila(Slimy)	Kshalana(Cleansing) Lepana(Coating)

4
3
1
Atherosclerosis is a chronic inflammatory progressive disease of arteries characterized by the accumulation of low-density lipoprotein and remnant lipoprotein particles in focal areas of arteries particularly at regions of disturbed non-laminar flow at branch points in the arteries.^[10] It is a primary cause of atherosclerotic cardiovascular diseases resulting in heart attacks, stroke, peripheral arterial disease etc.^[11] It is widely prevalent in industrialized countries. Atherosclerosis can develop as a result of four main risk factors: smoking, diabetes mellitus, hypertension, and dyslipidaemia.^[12]

Manifestation of atherosclerosis is a multifactorial process whose exact pathogenesis is still not known. Since the time of Virchow, several theories have been proposed. A sedentary lifestyle with increased Blood pressure, Diabetes mellitus, and Smoking aetiological factors leads to endothelial dysfunction and injury.^[13] Chronic injury in the intima layer of muscular arteries produces an inflammation response. Lipid molecules, macrophages, and other fibrous components build up in the walls of arteries as a result of chronic inflammation. These accumulated materials change and form the plaques. Thin fibrous capping and a higher concentration of inflammatory cells are characteristics of vulnerable plaques. Additionally, the blood arteries undergo remodelling with compensatory expansion, increased diameter, decreased flexibility, and ultimately narrowing lumen, which leads to the development of atherosclerosis.^[14]

Combining the traditional concepts of Gurvadi Guna with scientific principles is key to discerning disease pathogenesis in the modern era. This integration is essential for improving our knowledge of disease mechanisms in contemporary healthcare. Gurvadi Guna which describes the fundamental attributes serves as a foundational framework for assessing the physiological balance within the body. A more holistic approach to diagnosis and treatment can be developed by synthesizing these ancient concepts with current scientific insights from the fields of physics, chemistry and biology. This integration offers a deeper understanding of how imbalances in the elemental qualities of the body may influence cellular and systemic functions, providing clarity in the pathophysiology of chronic diseases. The convergence of the principles of Ayurveda with scientific research holds the potential for more individualized, effective, and preventive therapeutic strategies. Ultimately, this approach fosters the development of a personalized healthcare model that bridges the gap between traditional knowledge and contemporary medicine.

Discussion:

The concepts presented in fundamental science align closely with the principles of Gurvadi Guna and its corresponding actions, highlighting their similarities. Guru-Laghu Guna may be compared with the 'mass' as heaviness is the main point to be understood. The term Manda generally refers to slowing down and can be compared to 'slow chemical reactions', while Teekshna corresponds to 'fast chemical reactions', illustrating the contrast between the two Guna. Hima and Ushna are the Guna which depict the 'temperature' or the 'thermodynamics' entity of pure science. Snigdha-Rooksha Guna softens or dries up the subject. It can be compared with the 'Fats' concept of pure science.

Comparing the Gurvadi Guna with concepts of Fundamental science are given in Table 02.

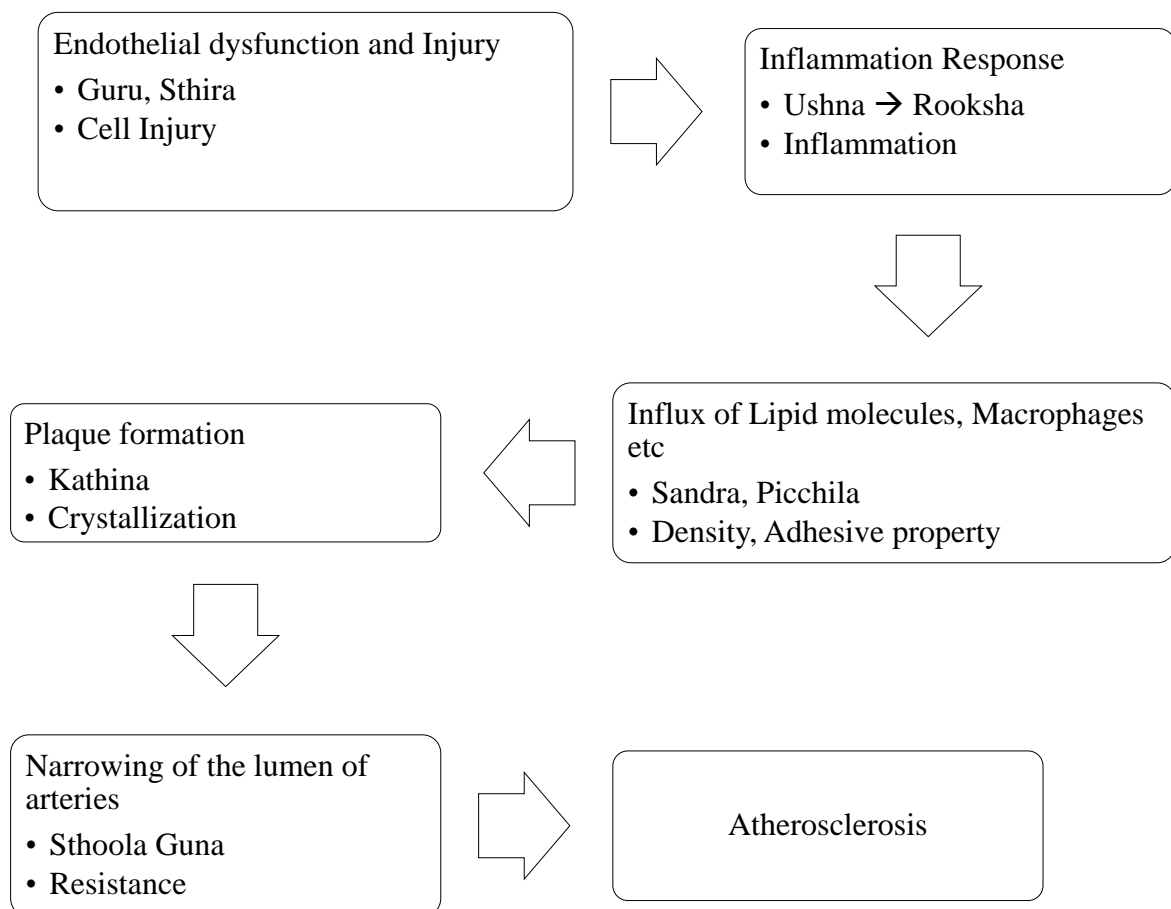
Table 02: Probable comparison of Gurvadi Guna with the concepts of pure science.

Sl. No.	Guna	Probable comparison of the concepts of pure science
1	Guru – Laghu	Mass
2	Manda – Teekshna	Chemical Reactions
3	Hima – Ushna	Temperature, Thermodynamics
4	Snigdha – Rooksha	Fats
5	Shlakshna – Khara	Friction
6	Sandra – Drava	Density, Viscosity
7	Mridu – Kathina	Crystallization
8	Sthira – Sara	Velocity
9	Sookshma - Sthoola	Resistance
10	Vishada - Picchila	Adhesiveness

In the pathogenesis of atherosclerosis, lipid molecules are having guru, Sthira Guna which obstructs the blood flow in the arteries causing endothelial injury. Whenever the cell injury happens in the body, some secretions are produced like cytokines, chemokines etc as an inflammation response by which Ushna Guna can be inferred. As a response to these secretions, the body tries to desiccate it with the help of Rooksha Guna. Due to the chronicity of this process dried particles along with the lipids and other substances infiltrate into the wall of arteries. The influx process where density increases in a particular area of the artery can be compared with Lepana karma by which one can discern the Picchila and Sandra Guna. Further, these substances undergo plaque formation where crystallization of the particle starts

because of the Kathina Guna. Plaques obstruct the blood flow in the artery through the Sthoola Guna which results in the narrowing of the lumen resulting in Atherosclerosis.

Signs and Symptoms of Atherosclerosis are seen only when the accumulated particles dislodge due to Vishada and Chala Guna. According to the location of dislodgement emergencies like Angina pectoris, Myocardial infarction, And Transient ischemic attacks can be manifested in the person.



Gurvadi Guna and the Concept of pure science can be understood in the pathogenesis of Atherosclerosis as mentioned in Figure 01.

Figure 01: Interpretation of Gurvadi Guna and Concept of Basic Science in the Pathogenesis of Atherosclerosis

Thus the obstruction of blood flow is influenced by various Guna like Guru, Sthira, and Picchila leading to endothelial injury and chronic inflammation. The body's response

through Ushna and Rooksha Guna contributes to the desiccation and infiltration of particles into the arterial walls. Over time, plaque formation occurs due to Kathina Guna and Sthoola Guna causing the narrowing of the arteries. The condition remains asymptomatic until dislodged particles, influenced by Vishada and Chala Gunas, lead to severe complications.

To effectively plan the treatment for atherosclerosis, it is essential to use Dravya which possesses Sookshma, Vishada, and Sara Guna which help in either the Shodhana or Shamana line of treatment. Sneha Dravya (Unctuous substances) processed with these properties enhances flexibility and promotes better circulation by widening the diameter of blood vessels. This in turn helps to reduce arterial stiffness and improve blood flow. Regular use of such Sneha Dravya can aid in the prevention of plaque accumulation and ensure optimal vascular function, thereby mitigating the risk of complications associated with atherosclerosis.

Conclusion:

Guna plays a crucial role in the pathogenesis of atherosclerosis. These Guna reflect the accumulation of excess fat which obstructs the normal flow of circulation, leading to hardened, narrowed arteries. The heaviness and stagnation caused by these imbalances are the major cause of the development of atherosclerosis. To treat this condition, treatments that possess the opposite Guna such as Sookshma, Vishada, Sara etc to counteract the effects of Gurvadi Guna which took place in the manifestation of the atherosclerosis are essential. Additionally, integrating the principles of pure science, such as an understanding of the molecular mechanisms of atherosclerosis is vital for comprehending its pathogenesis in detail. This fusion of Ayurveda wisdom and modern scientific knowledge leads to a more holistic and effective approach to diagnosing and treating atherosclerosis.

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<https://ijnrd.org/viewpaperforall.php?paper=IJNRD2404489>

Acknowledgements:

Name Role

- Nil

Source(s) of support: Nil

Conflicting Interest:

- Nil