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A Meta Analysis on Cardiac Vascular Disease with Obesity

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ABSTRACT

Increasing evidence suggests that inflammatory and immunological factors present in the general population play a role in the pathogenesis of cardiovascular disease in RA. More than that, RA is treated with a wide range of drugs, many of which have the potential to alter cardiovascular function. Non-steroidal anti-inflammatory medicines (NSAIDs) have been linked to an increased risk, whereas some treatments, like methotrexate and TNF inhibitors, have been linked to a reduced risk. Cardiac catheterization is just one of several possible procedures that can be done on the heart. More than a million people in the United States get cardiac catheterization each year. [1] Any time a surgeon makes incisions into a patient, they must be ready for the possibility of complications, whether they arise from the patient or the surgery itself. Fortunately, the prevalence of these issues has decreased considerably in recent years thanks to developments in cardiac catheterization equipment, advances in the experience of the operators, and the introduction of novel methods. The term "cardiac catheterization" can refer to either a right heart or a left heart catheterization, or both. Depending on the patient's condition, interventional cardiologists can do either diagnostic or therapeutic operations. The dangers and difficulties that can arise during a diagnostic cardiac catheterization are briefly discussed in this article.

Keywords- NSAIDS, Cardiac disease, Treatment, Complication.

I. INTRODUCTION

Patients suffering with rheumatoid arthritis (RA) have a significantly increased risk of cardiovascular-related morbidity and mortality as compared to the general population. There is no correlation between this increased risk and factors such as age, smoking, gender, hypertension, or raised cholesterol levels. When utilising standard CVD prediction models, patients who have rheumatoid arthritis are frequently treated as if they had a cardiovascular disease risk that is 1.5 times higher than average. [1]. The pathophysiology of cardiovascular sickness in RA is becoming more understood, and it appears to be related to inflammatory and immunological variables that are common in the population. On top of that, there is a wide variety of medication that is used to treat RA, and many of these medications can have an effect on the health of the cardiovascular system. Other treatments, such as methotrexate and inhibitors of tumour necrosis factor (TNF), have been related to a lower risk, while others, such as non-steroidal anti-inflammatory drugs (NSAIDs), have been connected to an increased risk. There are a wide variety of procedures that can be performed on the heart, but cardiac catheterization is one of the most prevalent. In the United States each year, there are more than one million people who have cardiac catheterizations done. [1] During any invasive surgery, you should always be prepared for the possibility of complications, both from the patient and from the operation itself. As a result of advancements in cardiac catheterization technology, increases in the operators' level of expertise, and the implementation of novel procedures, the rates of occurrence of these complications have dropped dramatically in recent years.

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When referring to a "cardiac catheterization," it is important to note that it is possible to do either a right heart catheterization, a left heart catheterization, or both. Interventional cardiologists are able to perform either diagnostic or therapeutic procedures on patients, depending on the nature of the patient's ailment. This article offers a brief summary of the potential risks and complications that may be associated with a typical diagnostic cardiac catheterization.

II. MATERIAL & METHODS

Author survey the literature using the terms "cardiovascular disease," "cardiovascular complication," "cardiovascular system," and "cardiovascular risk" in Pubmed, Scopus, and Web of Science. This article is a synthesis of the most up-to-date relevant reviews, systematic reviews, or meta-analyses, as well as any additional information gained from the most recent relevant articles.

III. PATHOGENESIS OF CARDIOVASCULAR DISEASES

To put it simply, cardiovascular disease is a condition in which the blood vessels are constantly inflamed. As a major contributor to global morbidity, it is a serious public health and economic issue around the world. Some frequent CVDs, such as atherosclerosis, vascular disease, and heart disease, play a significant role in the global disability and mortality structure. 14,15 Increased levels of proinflammatory cytokines like interferon- (IFN-), IL-1, IL-6, and TNF- are linked to various heart diseases like coronary heart disease (CHD), atherosclerotic heart disease, and congestive heart failure (CHF). The development of an atherosclerotic plaque is greatly aided by the presence of these cytokines. In the inner layer (also called the "tunica intima") of artery walls (endothelium), the atheroma accumulates macrophages, lipid-laden cells, mast cells, T cells, and other degenerative material. 16–19 Once activated, macrophages release a cocktail of cytokines, chemokines, and other pro-inflammatory molecules that damage tissue and set the stage for further inflammation. This encourages the growth of atherosclerotic plaque. 19–21 Inflammatory cytokines play a significant role in atherosclerotic plaque formation. Plaques and lesions have a significant effect on endothelial function. This disrupts the endothelium's normal function and promotes the early stages of the atherosclerotic process. 14 Many chronic inflammatory disorders are also linked to the production of inflammatory cytokines. Recent research has shown that high levels of cytokines like TNF-, IL-6, and IL-1 encourage the expression of pro-atherogenic genes. 22 An inflammatory response in the vessel wall is triggered by the retention and infiltration of endothelial tunica intima. 19 Phospholipid release is stimulated when low-density lipoprotein (LDL) is modified by enzymatic attack or oxidation in its inner layer. Because of this, endothelial cells can be stimulated, which may hasten the upregulation of inflammatory gene expression. As a result, a buildup of lipid-laden cells or lipids may trigger an inflammatory cascade in the artery. 23,24 Foam cells develop after monocytes are recruited by chemokines and then differentiate into macrophages within the tunica intima. Proinflammatory signals are amplified due to macrophage proliferation and secretion of inflammatory cytokines and growth factors. 25 The development of atherosclerotic lesions relies heavily on this stage. 26 Not only that, but this process enhances the activity of toll-like receptors. 19 These receptors activate cells by setting off a chain reaction of signals. When a macrophage becomes activated, it secretes molecules like nitrogen radical molecules, proteases, cytotoxic oxygen, and inflammatory cytokines. 27 Mast cells, dendritic cells and endothelial cells also show similar effects.

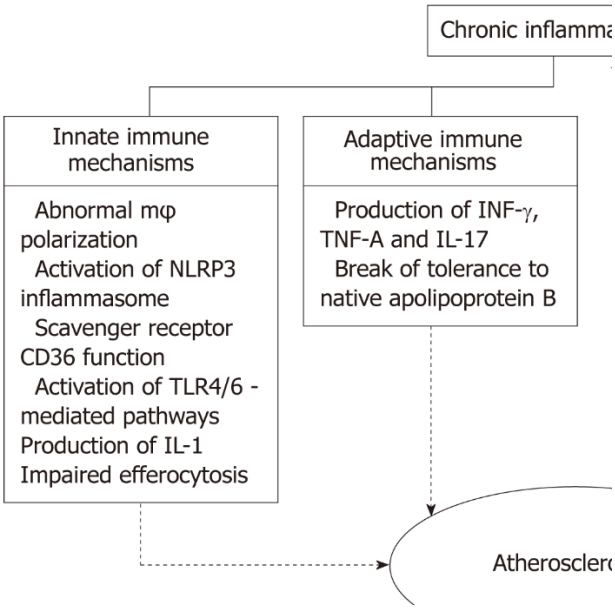

Fig. 1: Mechanism of CVDs induced by inflammation ("+" = increased).

Numerous toll-like receptors recognise bacterial toxins, DNA motifs and stress proteins. 27 Furthermore, oxidised LDL particles and heat-shock protein 60 of human being may stimulate toll-like receptors. 28,29 Cells in atherosclerotic plaques show a spectrum of these receptors and inflammation of atherosclerosis may be dependent on this pathway. 30,31 \sT cells, the immune cells, also contribute in atherogenesis. 25 Natural killer T cells are available in early atherosclerotic plaques. Lipid antigens are recognised by these cells. The activation of these killer cells induces atherosclerotic lesions in ApoE knockout mice. 32 Different viral antigens may be present in the plaques, which are recognised by these cells. The activation of these cells in knockout mice may also initiate or stimulate atherosclerosis by promoting the death of arterial cells.

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33 Furthermore, T-cell activation causes the release of inflammatory cytokines. Responses of type 1 helper T cells (Th1) activate inflammatory macrophages, and responses of type 2 helper T cells (Th2) speed up allergic inflammatory processes; both are typical in inbred mice. 19,34 Atherosclerotic plaques have cytokines that can spark a Type 1 immune response. By releasing the macrophage-stimulating cytokine IFN-, activated T cells develop into Th1 effector cells, which in turn stimulates the production of inflammatory TNF and IL-1, as previously discussed (19,35). The vascular cells' production of various cytotoxic and inflammatory molecules is enhanced by the synergistic effect of these cytokines. 36 The accumulation of these factors leads to the development of atherosclerotic lesions (Figure 1). Atherogenic risk factors include smoking, high cholesterol, high blood pressure, diabetes, and obesity. 36,37

IV. ENDOTHELIAL DYSFUNCTION

Normal homeostatic conditions are characterised by minimal or no expression of proinflammatory factors by the endothelium, hence preserving normal vascular tone and blood fluidity. Endothelial dysfunction is linked to both established and emerging cardiovascular risk factors like smoking, ageing, high cholesterol, high blood pressure, high blood sugar, and a family history of early atherosclerotic disease. The result is a chronic inflammatory process that raises the risk of cardiovascular events by decreasing antithrombotic factors and increasing vasoconstrictor and prothrombotic products and aberrant vasoreactivity (Figure 2). Recent research has also linked endothelial dysfunction to being overweight, having high levels of C-reactive protein, and having a persistent systemic infection.

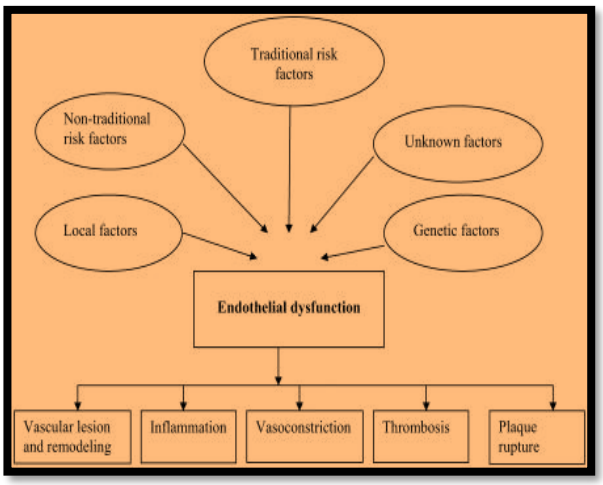

Fig. 2: Endothelial dysfunction and potential causes.

Reactive oxygen species (ROS) are produced at sites of inflammation and injury, and while at low concentrations they can act as signalling molecules in the regulation of fundamental cellular activities like cell growth and cell adaptation responses, at higher concentrations they can cause cellular injury and death. The vascular endothelium is a key target of oxidative stress and plays an important role in the pathogenesis of numerous vascular illnesses and disorders by controlling the delivery of macromolecules and circulating cells from the blood to the tissues. Endothelial signal transduction and redox-regulated transcription factors are directly affected by oxidative stress, leading to an increase in vascular endothelial permeability and an increase in leukocyte adhesion.

ROS (reactive oxygen species) generation is the backbone of oxidative stress, and it relies on both enzymatic and nonenzymatic processes. Some enzyme activities, such as those in the respiratory chain, prostaglandin synthesis, phagocytosis, and the cytochrome P450 system, can generate reactive oxygen species (ROS) [10–20]. Several enzymes, including peroxidases, xanthine oxidases, and NADPH oxidases, are capable of generating the superoxide radical (O2•). Once created, it participates in a variety of processes that lead to the production of byproducts such as hydrogen peroxide, hydroxyl radicals (OH•), peroxynitrites (ONOO), hypochlorous acid (HOCl), and so on. Oxidases such as amino acid oxidase and xanthine oxidase are among the many enzymes that generate hydrogen peroxide (a nonradical). Oxygen monoxide (O2•) and hydrogen peroxide (H2O2) combine to form hydroxyl radical (OH•) in the presence of a catalyst (Fe2+ or Cu+) [12-19]. Within living organisms, OH• is the most active free radical species. The NO• radical, which is generated when arginine is oxidised by nitric oxide synthase (NOS) to citrulline, has multiple critical physiological roles [12-19]. Free radicals are created, for example, when oxygen combines with organic substances or when cells are subjected to ionising radiation. Free radicals can also be generated during mitochondrial respiration via pathways other than enzymes [15, 16, 19]. The generation of free radicals involves multiple paths, some of which originate internally and others externally. Endogenous free radical production can be attributed to immune cell activation, inflammation, ischemia, infection, cancer, intense physical activity, psychological stress, and ageing. Exogenous free radical production can be triggered by exposure to things like environmental pollutants, heavy metals (Cd, Hg, Pb, Fe, and As), certain medications (cyclosporine, tacrolimus, gentamycin, and bleomycin), chemical solvents, cooking (smoked meat, used oil, and fat), cigarette smoke, alcohol, and radiation [15-25]. Free radicals are produced as a byproduct of the destruction or metabolism of these exogenous chemicals after they enter the body.

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V. CARDIAC DISEASE AND FAMILY HISTORY FACTORS

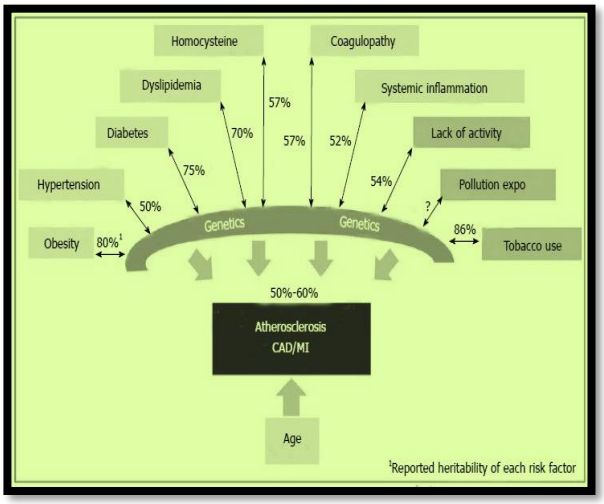

Fig. 3: The onset of atherosclerosis is often delayed by decades, and the disease is caused by a complex interplay of genetic and environmental variables.

Approximately 50% to 60% of coronary artery disease and coronary heart disease are inherited. Each risk factor's heritability is presented as a percentage. Myocardial infarction and coronary artery disease are abbreviations.

VI. DIABETES AND HYPERTENSION

Lifestyles characterised by low energy expenditure and excessive caloric consumption are increasingly adopted, especially in low-income and developing nations, contributing to the worldwide epidemic of obesity and type 2 diabetes (T2D). By 2040, the estimated number of people living with type 2 diabetes rises from the current 415 million to 642 million. 1 Even more prevalent, with a recent global estimate of 1.39 billion cases, is hypertension, whose incidence is also on the rise in the same countries. 2

Despite the simplicity with which both T2D and hypertension can be identified in a patient's medical history, both conditions are in fact complicated and varied phenotypes that raise the risk of potentially fatal cardiovascular disease (CVD). Since both disorders overlap several characteristics of their pathophysiology, especially those linked to obesity and insulin resistance, their frequent coexistence in the same individual is not a coincidence. For instance, in the San Antonio Heart Study, hypertension was present in 85% of those with T2D by the fifth decade of life, while it was present in 50% of those with hypertension. 3 In a healthy body, insulin coordinates metabolic processes involving carbohydrate, protein, and fat to keep glucose levels stable. However, insulin resistance is selective for glucose and lipid metabolism, e.g., sparing insulin's action to retain sodium in the distal tubule. Insulin resistance primarily affects the liver, muscle, and adipose tissues. 4, 5 When insulin-mediated glucose elimination slows, the body responds by secreting more insulin to restore equilibrium. Without a sufficient endocrine pancreas response, glucose intolerance develops; yet, some obese people can prevent type 2 diabetes due to a supranormal B-cell response. 6 Adipose tissue's part in these correlations has come to be seen as more important as of late. 7 Microvascular (affecting smaller arteries and capillaries) and macrovascular (affecting larger arteries like conduit conduits) illness are both linked to diabetes. Vascular problems of diabetes can be triggered by a number of factors, including (1) increased development of advanced glycation end products (AGEs) and activation of the receptor for advanced glycation end products (RAGE) AGE-RAGE axis, (2) oxidative stress, and (3) inflammation. 8 Furthermore, new research points to a potential function for microRNAs (miRNAs) in diabetic vasculopathy (see further on). 9 Since hypertension is characterised by vascular dysfunction and injury, it is a major risk factor for diabetes-related vascular problems (fig: 4).

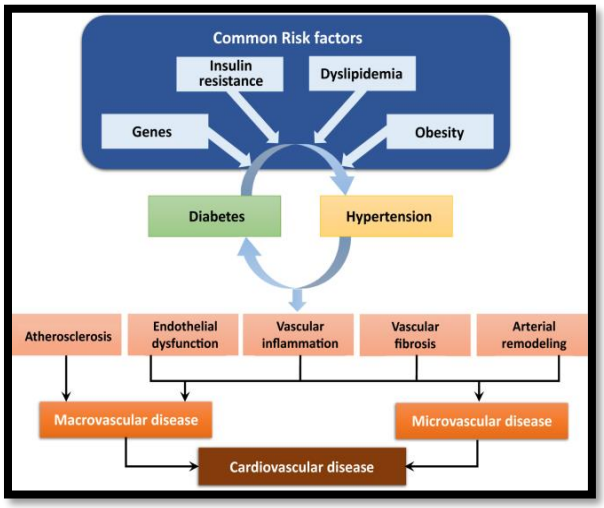

Fig. 4: The vascular mechanisms via which diabetes and hypertension increase the risk of cardiovascular illness.

Hypertension and diabetes are promoted by the same risk factors that also contribute to atherosclerosis, vascular inflammation, endothelial dysfunction, and structural remodelling, all of which contribute to the development of macrovascular and microvascular illness. When diabetes and hypertension exist together, the damage to blood vessels and endothelial function is magnified.

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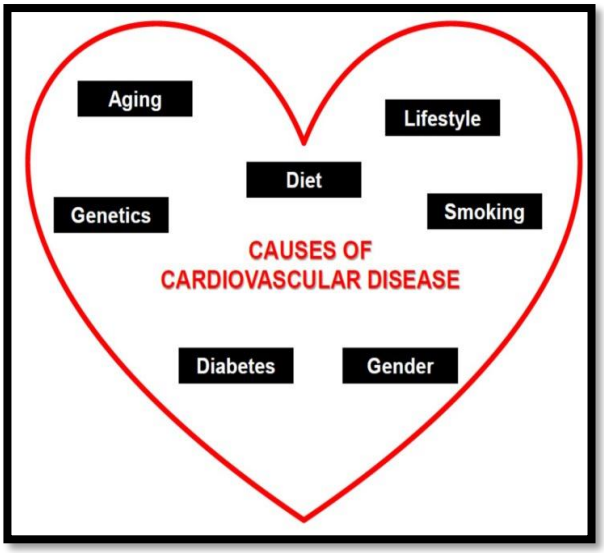

Fig. 5: Unhealthy food patterns, along with a lack of activity, overweight and obesity, ageing, gender, heredity, or a smoking habit, among others, could lead to the development of cardiovascular disease (CVD)

Inflammatory atherosclerosis is a major contributor to mortality from cardiovascular disease (CVD). Oxidative stress and systemic inflammation [10,11,12,13] are affected by dietary variables, with high-calorie intake and inactivity both leading to the production of inflammatory cytokines [14]. Accumulation of lipids and the development of lipid-laden macrophages both occur in the sub-endothelial zone of the arterial wall, making it an important site in inflammatory processes [15,16]. Current scientific discoveries [17] relate chronic inflammation to the onset, growth, and progression of atheroma plaque and rupture, as well as post-angioplasty and restenosis of coronary artery disease (CAD). Key mediators of CAD progression include C-reactive protein (CRP), interleukin (IL)-1, IL-6, IL-8, IL-1, IL-18, monocyte chemoattractant protein (MCP)-1, and tumour necrosis factor (TNF). These mediators are also considered potential inflammatory biomarkers since their expression levels may correlate with the severity of CAD [17,18,19]. Therefore, new studies demonstrate that Western diets cause an increase in proinflammatory cytokine production and a decrease in the synthesis of anti-inflammatory cytokines [20,21,22,23]. This is in contrast to healthier diets like the "Mediterranean diet" (MeDiet). Red meat consumption has been associated to increased inflammation [24,29,30,31], while eating fruits, vegetables, whole grains, nuts, seeds, and legumes all have anti-inflammatory properties. Consuming a diet rich in fruits, vegetables, legumes, nuts, and whole grains may help lower chronic low-grade inflammation and protect against cardiovascular disease [32,33,34,35]. Microbiota have been related to the immune system, the bioactivation and metabolism of nutrients like vitamins B and K, as well as bioactive compounds, and the composition of the gastrointestinal tract. Increased plasma trimethylamine N-oxide (TMAO) is produced when gut bacteria break down dietary components such L-carnitine, betaine, and choline [36,37,38]. This has been linked to an increased risk of diabetes, hypertension, and atherosclerosis in recent clinical studies. Dysbiosis of the gut microbiota has been related to an increased risk of cardiovascular disease, and diet has been proven to have a major effect on the make-up and function of gut microbiota. Endothelial dysfunction is associated with atherosclerosis' earliest stages, when lipids, notably low-density lipoproteins (LDL), are internalised in the intima [39]. Negative effects, such as inflammation, thrombus formation, calcifications, stenosis, rupture, and bleeding, can occur when endothelial function is impaired [15,40].

To further intensify the inflammatory response, low-density lipoprotein (LDL) particles infiltrate the EM at the same time that circulating monocytes cling to the endothelium and develop into macrophages that invade the sub-endothelial region. LDL retention in EM is mediated by proteoglycans, which enhances intimal retention [41]. Inflammatory cells produce reactive oxygen species (ROS) and enzymatic modification that can oxidise LDL particles lodged in the intima. When macrophages consume oxidised LDL (oxLDL) particles, they change into foam cells. Adherent platelets aid in the development of plaques by secreting chemotactic molecules and growth factors, which is encouraged by endothelial dysfunction [42]. Additionally, vascular smooth muscle cells (VSMCs) contribute to plaque formation. Growth factors and cytokines secreted by foam cells encourage vascular smooth muscle cell (VSMC) migration to the intima, where they help build the fibrous cap [43]. The accumulation of lipids causes the death of foam cells and macrophages and the release of pro-thrombotic molecules [44,45]. Pro-thrombotic factors aid in the development and rupture of atherosclerotic plaques, which triggers platelet activation and aggregation, which in turn leads to thrombus formation [46]. Clinical manifestations of atherosclerosis progression include cardiovascular events such heart attack and stroke as well as peripheral artery disease, heart failure, and sudden death [47].

VII. CONCLUSION

Additional efforts to improve the analysis strategies, including new imputation and meta-analytic methods, analysis of gene-gene and gene-environment interactions, the integration of different omics, and use of sequencing technologies, are being performed. intermediate risk can be carried out as a second step or in parallel, and further studies to develop new ways to include this information in risk functions, to evaluate its cost-effectiveness, and to explore the ethical issues are also warranted. Finally, although medicine is always a

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"personalized science and art", use of genetic information to identify the most effective and least harmful drug for each patient is also a goal of so-called genetic personalized medicine.

REFERENCES

[1] Awuchi, C. G., Amagwula, I. O., Priya, P., Kumar, R., Yezdani, U., & Khan, M. G. (2020). Aflatoxins in foods and feeds: A review on health implications, detection, and control. *Bull. Environ. Pharmacol. Life Sci*, *9*, 149-155.

[2] Umama, Y., Venkatajah, G., Shourabh, R., Kumar, R., Verma, A., Kumar, A., & Gayoor, M. K. (2019). Topic-The scenario of pharmaceuticals and development of microwave as; sisted extraction technique. *World J Pharm Pharm Sci*, *8*(7), 1260-1271.

[3] Kumar, R., Saha, P., Lokare, P., Datta, K., Selvakumar, P., & Chourasia, A. (2022). A Systemic Review of Ocimum sanctum (Tulsi): Morphological Characteristics, Phytoconstituents and Therapeutic Applications. *International Journal for Research in Applied Sciences and Biotechnology*, *9*(2), 221-226.

[4] Daharia, A., Jaiswal, V. K., Royal, K. P., Sharma, H., Joginath, A. K., Kumar, R., & Saha, P. (2022). A Comparative review on ginger and garlic with their pharmacological Action. *Asian Journal of Pharmaceutical Research and Development*, *10*(3), 65-69.

[5] Saha, P., Nyarko, R. O., Lokare, P., Kahwa, I., Boateng, P. O., & Asum, C. (2022). Effect of Covid-19 in Management of Lung Cancer Disease: A Review. *Asian Journal of Pharmaceutical Research and Development*, *10*(3), 58-64.

[6] Kumar, R., & Saha, P. (2022). A Review on Artificial Intelligence and Machine Learning to Improve Cancer Management and Drug Discovery. *International Journal for Research in Applied Sciences and Biotechnology*, *9*(3), 149-156.

[7] Saha, P., Kumar, A., Bhanja, J., Shaik, R., Kawale, A. L., & Kumar, R. (2022). A Review of Immune Blockade Safety and Antitumor Activity of Dostarlimab Therapy in Endometrial Cancer. *International Journal for Research in Applied Sciences and Biotechnology*, *9*(3), 201-209.

[8] Kumar, R., Keshamma, E., Paswan, S. K., Saha, P., Trivedi, U., Chourasia, A., & Otia, M. (2022). Alkaloid Based Chemical Constituents of Ocimum santum & Cinchona Bark: A Meta Analysis. *Journal for Research in Applied Sciences and Biotechnology*, *1*(2), 35-42.

[9] Singh, Y., Paswan, S. K., Kumar, R., Otia, M. K., Acharya, S., Kumar, D., & Keshamma, E. (2022). Plant & Its Derivative Shows Therapeutic Activity on Neuroprotective Effect. *Journal for Research in Applied Sciences and Biotechnology*, *1*(2), 10-24.

[10] Nyarko, R. O., Roopini, R., Raviteja, V., Awuchi, C. G., Kumar, R., Faller, E. M., ... & Saha, P. (2022). Novel Sars-CoV-2 Variants & Therapeutic Effects. *Journal for Research in Applied Sciences and Biotechnology*, *1*(2), 25-34.

[11] Saha, P., Kumar, R., Nyarko, R. O., Kahwa, I., & Owusu, P. (2021). HERBAL SECONDARY METABOLITE FOR GASTRO-PROTECTIVE ULCER ACTIVITY WITH API STRUCTURES.

[12] Roshan, K. (2020). Priya damwani, Shivam kumar, Adarsh suman, Suthar Usha. An overview on health benefits and risk factor associated with coffee. *International Journal Research and Analytical Review*, *7*(2), 237-249.

[13] Dubey, A., Yadav, P., Verma, P., & Kumar, R. (2022). Investigation of Proapoptotic Potential of Ipomoea carnea Leaf Extract on Breast Cancer Cell Line. *Journal of Drug Delivery and Therapeutics*, *12*(1), 51-55.

[14] Sahana, S. (2020). Purabi saha, Roshan kumar, Pradipta das, Indranil Chatterjee, Prasit Roy, Sk Abdur Rahamat. *A Review of the 2019 Corona virus (COVID-19) World Journal of Pharmacy and Pharmaceutical science*, *9*(9), 2367-2381.

[15] Sahana, S. (2020). Purabi saha, Roshan kumar, Pradipta das, Indranil Chatterjee, Prasit Roy, Sk Abdur Rahamat. *A Review of the 2019 Corona virus (COVID-19) World Journal of Pharmacy and Pharmaceutical science*, *9*(9), 2367-2381.

[16] Bind, A., Das, S., Singh, V. D., Kumar, R., Chourasia, A., & Saha, P. Natural Bioactives For The Potential Management Of Gastric Ulceration. *Turkish Journal of Physiotherapy and Rehabilitation*, *32*(3).

[17] Nyarko, R. O., Prakash, A., Kumar, N., Saha, P., & Kumar, R. (2021). Tuberculosis a globalized disease. *Asian Journal of Pharmaceutical Research and Development*, *9*(1), 198-201.

[18] Raj, A., Tyagi, S., Kumar, R., Dubey, A., & Hourasia, A. C. (2021). Effect of isoproterenol and thyroxine in herbal drug used as cardiac hypertrophy. *Journal of Cardiovascular Disease Research*, 204-217.

[19] Kumar, R., & Dubey, A. PHYTOCHEMICAL INVESTICATION AND HEPTOPROTECTIVE EVALUTION ACACIA RUBICA EXTRACT ISONIZED AND PARACETAMOL INDUSED ANIMAL TOXICITY. *Turkish Journal of Physiotherapy and Rehabilitation*, *32*(3).

[20] Singh, M. K., Kumar, A., Kumar, R., Kumar, P. S., Selvakumar, P., & Chourasia, A. (2022). Effects of Repeated Deep Frying on Refractive Index and Peroxide Value of Selected Vegetable Oils. *International Journal for Research in Applied Sciences and Biotechnology*, *9*(3), 28-31.

[21] Saha, P., Kumar, R., Nyarko, R. O., Kahwa, I., & Owusu, P. (2021). HERBAL SECONDARY METABOLITE FOR GASTRO-PROTECTIVE ULCER ACTIVITY WITH API STRUCTURES.

[22] Nyarko, R. O., Kumar, R., Sharma, S., Chourasia, A., Roy, A., & Saha, P. (2022). ANTIBACTERIAL

ISSN: 2583-4053

Volume-1 Issue-3 || August 2022 || PP. 78-85

https://doi.org/10.55544/jrasb.1.3.10

ACTIVITY OF HERBAL PLANT-TINOSPORA CORDIFOLIA AND CATHARNTHUS ROSEUS.

[23] Sahana, S., Kumar, R., Nag, S., Paul, R., Chatterjee, I., & Guha, N. (2020). A REVIEW ON ALZHEIMER DISEASE AND FUTURE PROSPECTS.

[24] Sahana, S. (2020). Roshan kumar, Sourav nag, Reshmi paul, Nilayan guha, Indranil Chatterjee. A Review on Alzheimer disease and future prospects. *World Journal of Pharmacy and Pharmaceutical science*, *9*(9), 1276-1285.

[25] Nyarko, R. O., Saha, P., Kumar, R., Kahwa, I., Boateng, E. A., Boateng, P. O., ... & Bertram, A. (2021). Role of Cytokines and Vaccines in Break through COVID 19 Infections. *Journal of Pharmaceutical Research International*, *33*, 2544-2549.

[26] PURABISAHA, R. K., RAWAT, S. S. N., & PRAKASH, A. (2021). A REVIEW ON NOVEL DRUG DELIVERY SYSTEM.

[27] Nyarko, R. O., Boateng, E., Kahwa, I., & Boateng, P. O. (2020). A comparison analysis on remdesivir, favipiravir, hydroxychloroquine, chloroquine and azithromycin in the treatment of corona virus disease 2019 (COVID-19)-A Review. *World J. Pharm. Pharm. Sci*, *9*, 121-133.

[28] KUMAR, R., SAHA, P., SARKAR, S., RAWAT, N., & PRAKASH, A. (2021). A REVIEW ON NOVEL DRUG DELIVERY SYSTEM. *IJRAR-International Journal of Research and Analytical Reviews (IJRAR)*, *8*(1), 183-199.

[29] Nyarko, R. O., Boateng, E., Kahwa, I., Boateng, P. O., & Asare, B. (2020). The impact on public health and economy using lockdown as a tool against COVID-19 pandemic in Africa: a perspective. *J Epidemiol Public Health Rev*, *5*(3).

[30] Kumar, R., Saha, P., Pathak, P., Mukherjee, R., Kumar, A., & Arya, R. K. EVOLUTION OF TOLBUTAMIDE IN THE TREATMENT OF DIABETES MELLITUS. *Jour. of Med. P'ceutical & Alli. Sci*, *9*.

[31] Kumar, R., Saha, P., Kumar, Y., Sahana, S., Dubey, A., & Prakash, O. (2020). A Review on Diabetes Mellitus: Type1 & Type2. *World Journal of Pharmacy and Pharmaceutical Sciences*, *9*(10), 838-850.

[32] Daharia, A., Jaiswal, V. K., Royal, K. P., Sharma, H., Joginath, A. K., Kumar, R., & Saha, P. (2022). A Comparative review on ginger and garlic with their pharmacological Action. *Asian Journal of Pharmaceutical Research and Development*, *10*(3), 65-69.

[33] Saha, P., Nyarko, R. O., Lokare, P., Kahwa, I., Boateng, P. O., & Asum, C. (2022). Effect of Covid-19 in Management of Lung Cancer Disease: A Review. *Asian Journal of Pharmaceutical Research and Development*, *10*(3), 58-64.

[34] Kumar, R., Keshamma, E., Paswan, S. K., Saha, P., Trivedi, U., Chourasia, A., & Otia, M. (2022). Alkaloid Based Chemical Constituents of Ocimum santum & Cinchona Bark: A Meta Analysis. *Journal for Research in Applied Sciences and Biotechnology*, *1*(2), 35-42.

[35] Nyarko, R. O., Roopini, R., Raviteja, V., Awuchi, C. G., Kumar, R., Faller, E. M., ... & Saha, P. (2022). Novel Sars-CoV-2 Variants & Therapeutic Effects. *Journal for Research in Applied Sciences and Biotechnology*, *1*(2), 25-34.

[36] KUMAR, A. (2019). The Scenario of Pharmaceuticals and Development of Microwave Assisted Extraction Techniques.

[37] Kumar, R., & Saha, P. (2022). A Review on Artificial Intelligence and Machine Learning to Improve Cancer Management and Drug Discovery. *International Journal for Research in Applied Sciences and Biotechnology*, *9*(3), 149-156.

[38] Kumar, R., Keshamma, E., Paswan, S. K., Saha, P., Trivedi, U., Chourasia, A., & Otia, M. (2022). Alkaloid Based Chemical Constituents of Ocimum santum & Cinchona Bark: A Meta Analysis. *Journal for Research in Applied Sciences and Biotechnology*, *1*(2), 35-42.

[39] Nyarko, R. O., Roopini, R., Raviteja, V., Awuchi, C. G., Kumar, R., Faller, E. M., ... & Saha, P. (2022). Novel Sars-CoV-2 Variants & Therapeutic Effects. *Journal for Research in Applied Sciences and Biotechnology*, *1*(2), 25-34.

[40] Mukkamala, R., Kumar, R., Banerjee, S. K., & Aidhen, I. S. (2020). Synthesis of Benzyl C-Analogues of Dapagliflozin as Potential SGLT2 Inhibitors. *European Journal of Organic Chemistry*, *2020*(12), 1828-1839.

[41] Bhati, V., Yadav, P. K., & Kumar, R. (2018). Effect of Levels of Inorganic Fertilizers, Organic Manure and Bio-Fertilizers on Plant Growth Attributes of Onion (Allium cepa L.) cv. N-53 under Hot Arid Region of Western Rajasthan, India. *International J. Curr. Micro. Appl. Sci*, *7*, 3593-601.

[42] Bugga, P., Alam, M. J., Kumar, R., Pal, S., Chattopadyay, N., & Banerjee, S. K. (2022). Sirt3 ameliorates mitochondrial dysfunction and oxidative stress through regulating mitochondrial biogenesis and dynamics in cardiomyoblast. *Cellular Signalling*, *94*, 110309.

[43] Kumar, S., Yadav, S. P., Chandra, G., Sahu, D. S., Kumar, R., Maurya, P. S., ... & Ranjan, K. (2019). Effect of dietary supplementation of yeast (Saccharomyces cerevisiae) on performance and hemato-biochemical status of broilers.

[44] Kumar, R., Saha, P., Keshamma, E., Sachitanadam, P., & Subramanian, M. (2022). Docking Studies of Some Novel Hetrocyclic Compound as Acat Inhibitors: A Meta Analysis. *Journal for Research in Applied Sciences and Biotechnology*, *1*(3), 33-41.

[45] Amle, V. S., Rathod, D. A., Keshamma, E., Kumar, V., Kumar, R., & Saha, P. (2022). Bioactive Herbal Medicine Use for Eye Sight: A Meta Analysis. *Journal for Research in Applied Sciences and Biotechnology*, *1*(3), 42-50.

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https://doi.org/10.55544/jrasb.1.3.10

[46] Pandey, M., Singh, A., Agnihotri, N., Kumar, R., Saha, P., Pandey, R. P., & Kumar, A. (2022). Clinical Pharmacology & Therapeutic uses of Diuretic Agents: A Review. *Journal for Research in Applied Sciences and Biotechnology*, *1*(3), 11-20.

[47] Anubhav, S. P. D., Sanjay, K. D., & Roshan, K. (2022). Evaluation of Enzyme Producing K. Pneumoniae and Their Susceptibility to Other Anti-Biotics. *International Journal of Innovative Science and Research Technology2022*, *7*(5), 351-353.