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Review on Synthesis and Biological Importance of Thiazole Constituent in Heterocyclic Compounds

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Abstract: Thiazoles and similar components constitute including the most potential structures in the growing chemical sphere of heterocyclic compounds with significant biological importance. Being aware of several synthetic routes and diverse physicochemical properties, these thiazole compounds gained the distinctive consideration of researcher to undertake extensive research. Thiazole compounds produced by different ways have a wide-range of biological importance. This current analysis includes an overview on the synthesis and biological activity of drugs associated with thiazole nuclei.

Keywords: *Thiazole, heterocyclic compounds, biological importance, physicochemical properties*

I.INTRODUCTION:

The heterocyclic nucleus plays a crucial role in chemistry and acts as a fundamental structure for the synthesis of various therapeutic agents. It is well known that heterocycles compose the majority of the basic branches of organic chemistry and are extremely useful to biology and industry. They can be discovered in a wide variety of organic compounds of interest in electronics, biology, optics, pharmacology, material sciences, and other fields[1-2]. As component of the aromatic five-membered structural ring composition, C3H3NS, thiazole is stable heterocyclic organic compound that holds together a nitrogen and sulfur atom. The delocalization of one pair of electrons from the sulfur atom completes the required 6 π electrons to satisfy Huckel's rule, making thiazole aromatic. Also having both electron-accepting group (C=N) and an electron-donating group (-S-) made thiazole active[3-4].

Thiazole is structural comparisons with oxazole, where oxygen replaces sulfur and imidazole, where nitrogen replaces sulfur. Many chemical compounds, such as pharmaceuticals, fungicides, dyes, biological agents, and chemical reactions, are derived from thiazole[5-6]. A different heterocycle with nitrogen and sulfur atoms, thiazole plays a significant role in chemistry. Numerous manufactured and natural medicinally significant substances, including vitamin B1-thiamine, include this crucial core structure. Being a crucial component of penicillin nucleus and certain of its derivatives that exhibit antiretroviral (ritonavir), antihistaminic, antifungal (abafungin), antithyroid, antibacterial (sulfazole) and anthelmintics properties shows the versatility of thiazole nucleus[7-10]. In medicinal chemistry, there is still a lot of work being done to find new, biologically active heterocyclic analogues.

Synthesis and Biological Importance of Thiazole compounds:

Rouf, A., et al. reported thiazoles and benzothiazoles having different biological activities such as bleomycins and their related analogues are a family of glycopeptide antibiotics clinically used to treat several types of cancers, like squamous cell carcinomas, malignant lymphomas and testicular cancers[11]. Gundogdu-Karaburun synthesized and tested 2-((5-substituted-4-methylthiazol-2-yl) amino)-2-oxoethyl 4- substitutedpiperazine-1-carbodithioate derivatives. Reacting 2-chloro-N-(5-substituted-4-methylthiazole-2- yl)acetamide derivatives and sodium salts of appropriate N-substitutedpiperazine dithiocarbamic acids in acetone to formed 2-((5-substituted-4-methylthiazol-2-yl)amino)-2-oxoethyl 4- substitutedpiperazine-1-carbodithioate derivatives which were tested against Gram (+), Gram (-) bacteria and yeasts such as Salmonella typhimurium, Staphylococcus epidermidis, Staphylococcus aureus, Escherichia coli, Candida albicans, Candida utilis, Candida tropicalis, Candida krusei and Candida glabrata using a microbroth dilution technique[12]. Series of 2-ethylidenehydrazono-5-arylazothiazoles synthesiszed from cyclocondensation of hydrazonyl halides and 2-(1-(pyridin-4-yl)ethylidene)hydrazinecarbothioamide. In vitro growth inhibitory effect of the synthesized compounds against hepatocellular carcinoma (HepG2) cell line was examined in contrast with doxorubicin as a standard medication by MTT test, and the results shown potential activities for the compounds reported by Gomha, S. M. et al. 2- mercaptobenzothiazole derived bis-heterocycles encompassing benzothiazole-1,2,3-triazole moieties conjugated through a sulphur linkage are synthesized and evaluated for their antiinflammatory activity[13]. Davyt, D., & Serra, G. reported thiazoles reduced derivatives found in marine sources which were isolated, synthetic and biological activities[14].

Kamble, R. D., Meshram, R. J. and et al. synthesized and investigated series of thiazoles bearing pyrazole. These assessed for their anti-inflammatory activity using *in vitro* and *in vivo* methods[15]. Helal, M. H. M. et al reported synthesis of Furo[2,3-d]thiazol-5(2H)-one from reaction of thiosemicarbazone derivative with diethyl acetylene dicarboxylate and series of 2-(hydrazinyl) thiazol-4(5H)-one 6,7 and 2-(4-(substituted)-thiazol-2-yl)hydrazono derivatives from thiosemicarbazone with α-halogenated compounds[16].

Kumara, G. N., Suneelab, S., & Pai, K. V. K.synthesized 2[4' (6,7dihydro 4H thieno [3,2 c] pyridine 5yl methyl) biphenyl 2yl] 4 methyl thiazole 5 carboxylic acid derivatives and were screened for their MIC and zone of inhibition against two strains

of bacteria Escherichia coli , Staphylococcus aureus[17]. Sadek, B. reported novel series of 1,3-thiazole and benzothiazole derivatives has been synthesized, and assessed for in vitro antimicrobial activity S. aureus E. coli and the fungal strain A. niger using the cup plate method[18]. Patel, H., et al. reported new pyrazol-1-yl-4-substitutedthiazole as an antibacterial drugs. It was obtained by reacting 3,5-diphenyl-4,5-dihydro-1H-pyrazole-1-carbothioamide with substituted phenacyl bromides in ethanol after the 1,3-diphenylprop-2-en-1-one was treated with thiosemicarbazide[19]. Parekh, N. M., evaluated the anticancer potential ofimidazolylphenylheterocyclic-2-ylmethylenethiazole-2-amines, a newly invented Schiff base[20]. Xiabing, M., et al., synthesized thiazole derivatives, through the one-pot three-component reaction of aldehyde/ketone, thiosemicarbazide, and chlorinated β-keto ester in EtOH, using CH_3COONa as a catalyst[21]. Arora, P. et al. reported series of 2,4-disubstituted thiazole derivatives and assessed for their in vitro antibacterial and antifungal activities[22].

II.CONCLUSION :

The synthesis of thiazole derivatives is quite interesting in the field of heterocyclic chemistry. A variety of methods have been used to synthesize thiazole constituent and similar compounds. These compounds have wide ranging of biological importance because of distinctive structural assembly. This review focused on the synthesis and biological important of heterocyclic compounds having thiazole constituent.

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IV.DECLARATION :

Conflict of interest: The authors declare that they have no conflict of interest.

Ethical approval: This has not been published elsewhere and is not currently under consideration for publication elsewhere.

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