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Synthesis and Characterization of 1,2-Dihydroquinoline Sulphonamides: Novel Derivatives with Enhanced Pharmacological Potential

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Abstract

The present investigation reports the synthesis and characterization of a novel series of 1,2-dihydroquinoline sulphonamides, developed with the aim of enhancing their pharmacological efficacy. The synthesis involved a multi-step process starting with the preparation of 3-hydroxy Acetanilide, followed by Pechmann condensation to obtain acetylated aminophenol, and subsequent reactions leading to the formation of 1,2-dihydroquinoline derivatives. These derivatives were further reacted with various substituted sulphonyl chlorides to yield the target sulphonamide compounds. The synthesized compounds were characterized using FT-IR, 1H NMR, 13C NMR, and LCMS. Their pharmacological activities, including antibacterial, anthelmintic, anti-inflammatory, and antihyperlipidemic properties, were evaluated through in-vitro assays. The results demonstrated that these novel 1,2-dihydroquinoline sulphonamides exhibit promising pharmacological activities, validating their potential as effective therapeutic agents.

Keywords:1,2-Dihydroquinoline, Sulphonamides, Synthesis, Characterization, Pharmacological Activity, Antibacterial, Anthelmintic, Anti-inflammatory, Antihyperlipidemic

Introduction

Quinoline is the most common heterocyclic compound in medicinal chemistry. Quinoline chemistry has been increasing interest as most of these substances are useful as chemotherapeutic agents for malaria and microbes [1, 2]. Quinoline was first isolated by Ferdinand Rungin1834fromthecoaltarbases(very high viscosity brown or black liquid)[3].Gerhardt later in 1842 obtained quinoline by alkaline pyrolysis of cinchonine, alkaloid analogue of quinoline. It was found that heterocyclic compounds containing nitrogen and oxygen are one of the most commonly synthesized and evaluatedcompoundsastheypossesspharmacologic alactivitiesincludingantihyperlipidemicandantimic robial activity.

Quinolines are an important class of natural flavonoids [4].These are biologicalagents, including antibiotic [5], anthelmintic [6], anti-inflammatory [7], anti-fungal [8-9],anti-tumour[10-11]andantimutagenic[12].Inaddition,somequinolin ederivativeshaveinhibitedmanyenzymessuchasxan thineoxidase[13],proteintyrosine kinase [14, 15] in cell systems. Therefore, the synthesis of quinolines is ofgreatinterest.

Quinolines are a group of synthetic wide spectrum antibacterial drugs. Nalidixic acidwasafirstgenerationquinolinesintroducedin196 2forthecure ofurinarytractinfections in humans. Georgelesherandco-workersdiscoveredNalidixicacidinadistillateduring anattemptatsynthesisoffamousantimalarialdrugchl oroquine.

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Quinolinederivatives exhibitedtheirantibacterialeffectbypreventingbacterialDNAreplicationinbacterialcell,however most of the quinolones in clinicalusebelongstothe fluoroquinolones, which have fluorine atom attached to benzenering. Therefore, we decided to synthesize quinoline derivatives and evaluate them fortheir activities for instanceAntibacterial, Anthelmintic, Anti-inflammatoryandAntihyperlipidemicactivity.

In literature, reviews on importance of alkylation reactions [16-18], formulations [19,20]anddosage[21]arewelldocumented.Thisgaveanimpetustothedevelopmentofnewerpharmacologicallyactivequinoline derivatives. Hence,wesynthesized someofthenovelquinolinederivativesasshowninthereactionscheme2.1andtoscreenthem fortheiractivities.

SanchezJPetal.[22]preparedanewseriesofamino sulfonamide andbenzene sulfonamide containing substituted piperazine quinoline carboxylic acids with(**1, 2**) at C-3 position and screened against various bacterial strains, using cup platemethod. Compounds revealed promising antibacterial activity against tested bacterialstrains.

Ghorabetal.[23]describedthepreparationoffewnew derivatives ofquinoline having quinoline hydrazone motif. These hydrazones act as CA inhibitors,which may be the reason for their Antihyperlipidemic activity. In vitro anti-canceractivity against MCF7 (breast cancer cell line) results show thatcompound **(3)**havingtetrahydroquinoline moietywas morepotent.

Lunniss et al. [24] developed selective PDE4 inhibitor quinolines **(4a, 4b)** with utilityinchronic

Smithandcoworkers[25]developedQuinolinebased NK3receptorantagonists**(5)**and**(6)**withCNSactivity

Vermaetal.[26]preparednewderivativesofquinoline-sulfonamideshybrids**(7)**asantimalarial.Theresults showed that thederivativesexhibited goodactivity.

Jiangetal.[27]describedthesynthesisofanovelseries ofquinolinederivativesaspotentc-JunN-terminalkinase(JNK)inhibitors**(8)**withselectivityagainstp38.Theresults revealed thatcompoundpossessedaremarkableinhibitionactivity(IC_{50}=0.15M.

ChloroquinolylderivativehavebeensynthesizedbyKovi etal. [28] the compound**(9)**exhibitedpotentantimalarialactivityat submicro molarconcentrationlevels.

Hu et al. [29] prepared pyridinylquinoline derivatives with PI3Kα inhibition activity.Amongst all,compound**(10)**showedexceptionalinhibitionofPI3Kα.In anotherresearch, the same group have reported unsaturated-sulfonylamino-quinolines **(11)** asPI3Kα inhibitors.All the compounds reportedbythemweretestedforPI3KαinhibitoryactivityandtheresultsshowedthattheypossessbetteractivitythanBEZ235,the positive control.

Chengetal.[30]havefiledapatentonaclassofmorpholino-quinolinesulphonamidesusefulintreatingthediseasessassociatedwith PI3K/mTORcancer. One of the representative compounds **(12)** effectively inhibited with IC50 <20nM.

Brown et al. [31] patented novel series of amino substituted quinoline sulphonamides.Allthecompoundsweretestedforlactatedehydrogenase Ainhibitoryactivityand they reported that the compound**(13)** exhibited a pIC50 value of 7.1 in no lessthanoneset of experimental runs.

Lee et al.[32] prepared quinoline sulphonamide derivatives as Antihyperlipidemicagents. Compound **(14)** presented good Antihyperlipidemic activity against the MDA-MB231,MDAMB468 and MCF-breast cancercell lines.

Mohsen Nikpour [33] research group designed and synthesized methyl benzamidederivatives and evaluated them for their inhibitory activity against human PDE3A andPDE3B. The best activity was obtained for the compound **(15)** (IC50 = 0.43 ± 0.04lM). obstructive pulmonary disorder.

Modather F et al.[34] planned and synthesized and characterized novel series ofmethylquinolin(1H)-one derivatives. In order to find good antioxidantagents, efficiencyinantioxidantactivityofthesynthesized compounds havebeeninvestigatedusingASTMd-942andASTMd-664.Goodactivitywasobservedinthecompound **(16)**.

P. Raghavendraetal.[35]synthesized a bunch of substituted benzylidene-1,2-dihydroquinolinecompoundsbycondensingsubstitutedimidazolewithsubstituted quinoline. The

compounds were inspected for anti-inflammatoryandits ulecerogenicity activities.They reported that all the leadcompounds (**17)** showed better activities against inflammation when compared withIbuprofen.

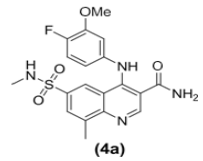
JumbadHetal.[36]synthesizedaseriesofnewquinolin-2-oneSchiffbasescontainingisoxazolinenucleus.Someofthesynthesizedcompoundshavebeenscreened for antibacterial activities against two types of bacteria *E. coli* and *S. aureus*.Compound**(18)**showedgood activityagainst*S. aureus*but not against*E. coli*.

MBDeshmukandcoworkers[37]synthesizedthecompound7-hydroxy-4-methylquinolin-2(1H)-one **(19)** by an easy and efficient microwave-assisted method.Compoundwassuccessfullycharacterizedonthebasisofits^{1}Hprotonand^{13}C carbonmagneticmeasurementsandelementalanalysis.Thecompoundwasalsosubjected forantibacterial andantifungal study.

Based on the survey of literature on quinolone containing sulphonamides andcompoundscontaining1,2-dihydroquinolinenucleus,itwas found thatcompounds arepharmacologicallyveryimportantthereforetheobjective ofpresentworkwas focusedtoplan and synthesize 1,2-dihydroquinolinederivativescontaining sulfonamide moiety.Finally, all the synthesizedderivativeswerewellcharacterizedand evaluated them for their *in-vitro*Antimicrobial, Anthelminthic, Anti-inflammatory and Antihyperlipidemic study. Insilico study was also performed to infer the bindingpatternofsynthesized compounds.

The objective of the present synthetic strategy was to synthesis 1,2-dihydroquinolinesulphonamidesderivatives**[4a-h].**Thesyntheticrouteforthe preparationisbasedonthetransformationof3-hydroxy Acetanilide intoacetylatedaminophenol followed bycyclized product.

Thesynthesisandcharacterizationof1,2-dihydroquinolinesulphonamides**[4a-h]**followsthebelow mentionedsequenceofreactions:



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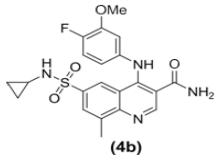

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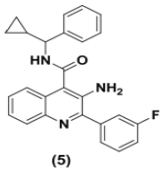

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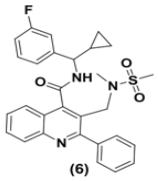

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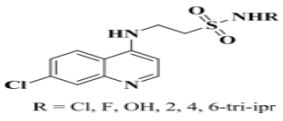

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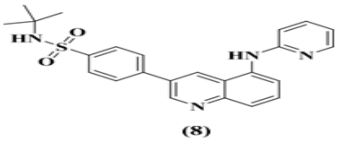

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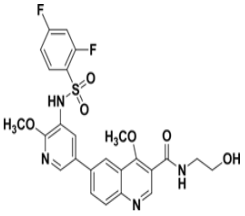

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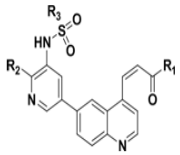

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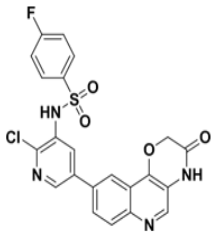

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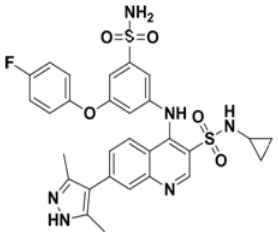

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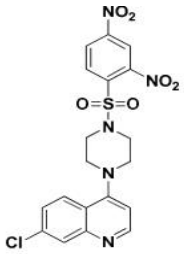

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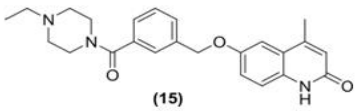

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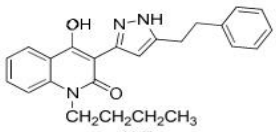

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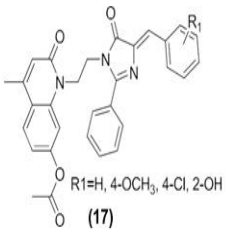

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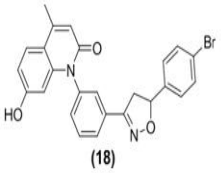

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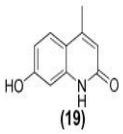


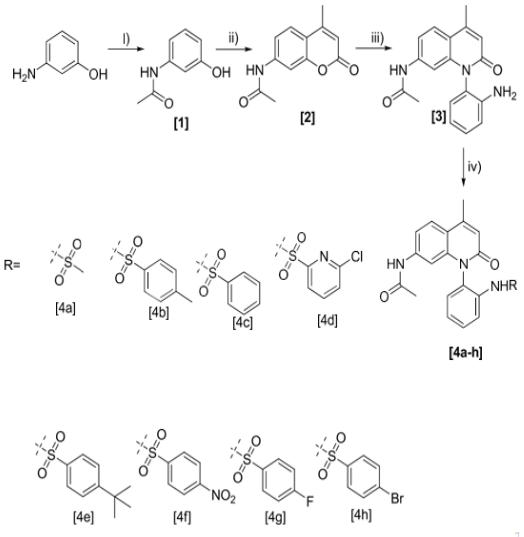
(19)

Step-1: Synthesis of 3-hydroxy Acetanilide **[1]** was carried out by the reaction of 3-aminophenolin presence of acetic acid withaceticanhydride.

Step-2: 3-hydroxy Acetanilide **[1]** underwent Pechmann condensation reaction withethylacetoacetatetoafford productacetylated aminophenol**[2].**

Step-3: Reaction of O-phenylenediamine with intermediate acetamide rearrangementtakesplaceleadingtoringopeningandsubsequenteliminationofwater affordedcondensedproduct**[3]**.

Step-4: **C**ompound **[3]** on reaction with substituted Sulfonamides in presence of baseunderwentcouplingreactiontoobtainsulphonamidescontainingdihydroquinolinederivatives**[4a-h].**Thesequenceofreactionforthesynthesisof1,2-dihydroquinolinesulphonamides**[4a-h]**hasbeenpresentedin**scheme-2.1**.



Scheme-2.1: Synthetic reaction scheme for the preparation of 1,2-Dihydroquinoline Sulphonamides[4a-h]

Material and Methods

Materials

OrganicsolventsandReagents

The organic solvents were purchased from SD Fine, Spectrochem, Sigma Aldrichandstandardcommercialsources areusedwithoutfurtherpurification.

Reagents and conditions:

i) $(CH_3CO)_2O$, CH_3COOH, 8h; ii) CH_3COCH_2COOEt,70% H_2SO_4, 0^oC, 9-10h; iii) O-phenylenediamine, NaOAc, rt, 8h; iv) SubstitutedSulfonylchlorides, Et_3N,CH_2Cl_2.

Reactionçonditions

Room temperature reactions mentioned ranges between 20-30°C (throughout theyear). For low temperatures reactions, ice-bath with sodium chloride (-5°C) wasused. Magnetically stirred oil bath (or) a hotplate was used for high temperaturereactions.

Analytiçaltechniques

Meltingpoint

For solid compoundsmelting point range was determined in opencapillarytubes usingadigital meltingpoint apparatus.

ThinlayerChṛomatography(TLC)

ReactionwasmonitoredbyTLCusingsilicaplates.The followingmobilephaseswereusedforelution-Hexane:Ethylacetate(or)dichloromethane: methanol in different ratios. TLC plates were visualized withultraviolet light oriodinevaporsorbystainingwith2%aqueouspotassiumpermanganatesolution.

Columnchroṃatography

Silicagel(60-120mesh)orneutralaluminawasusedforpurification ofsynthesizedcompounds.

Instrumeṇtation

Compoundswerecharacterizedbyavailablespectroscopictechniques andLCMS.

FT-IR

ThespectrawererecordedusingJASCOFTIR-4100spectrophotometeras KBr disc in the range of 4000-400 cm^{-1}. FT-IR data are reported as follows:Frequency (functional group).

^{1}HNMR aṇd^{13}C NMR

The ^1H and ^{13}CNMR spectra were recorded on JEOL-400 MHz spectrometersusing deuteriated solvents ($CDCl_3$& DMSO-d_6) and Tetramethylsilane (TMS)as an internal standard. The chemical shift values were expressed in δ ppm inboth^1H NMR (0-15 ppm) and ^{13}C NMR (0-200 ppm) spectra.

^1H NMR data is reported in the following order: chemical shift (multiplicity, Jvalue,numberofprotonsandnatureofproton).^{13}CNMRdataarereportedinthefollowingorder: chemical shift (numberedcarbonatom).

Massanalyses

WatersAlliance2795separationsmoduleandWaters MicromassLCTmassdetectorwas used to recordLC-MS.

Elementalanalysis

Elemental analysis (C,H and N) was performed on Elementarvario MICROcube.

Experimental

Step-1:Synthesisof3-hydroxyAcetanilide[1]

3-aminophenol (25g, 0.11mol) taken in round bottom flask containingacetic anhydride (80 mL) and it was stirred for 8 h at 60ºC under Nitrogen atmosphere.Afterreactioncompletion,excessacetic anhydridewasremovedoffunder reducedpressure;theresiduewasobtainedwhichwas dissolvedindichloromethane.The dichloromethane layer was washed with brine solution, driedoveranhydrousNa_2SO_4 and concentrated to achieve compound **[1].** LCMS: 152 (M+1), MP: 152 ºC. Yield:82%.

Step-2:Synthesisofintermediate acetamide[2]

3-hydroxy Acetanilide**[1]**(25g,0.11mol)wastakeninethylacetoacetate(0.1mol) with70%aq.H_2SO_4 (50mL),anditwasstirredfor9-10hat0ºC.Afterreactioncompletion,thereactionmixturewaspouredintoicecoldwater,solid separatesout.Thesolidwasfilteredandwashedwithwater.Thecrudeproductwasrecrystallized toobtain pure compound**[2].**

Step-3: Synthesis of*N-*[1-(2-aminophenyl)-4-methyl-2-oxo-1,2-dihydroquinolin-7-yl]acetamide[3]

Compound**[2]**(2.17g,0.01mole),o-phenylenediamine(0.01mole,1.08g)andsodium acetate (5 g) were taken in a round bottom flask containing glacial acetic acid(15 mL) and the resulting mixture was refluxed for 8 h. After completion reaction,

thereactionmixturewasbringdowntoroomtemperature.Theseparatedsolidwasfilteredandrecrystallized frommethanol:water(1:2)togivetitlecompound[**3].** LCMS: 237.8 (M+1), MP: 285ºC. Yield: 70%.

Step-4:Synthesisof1,2-dihydroquinolineSulphonamides[4a-h]

Equimolarquantitiesofcompound**[3]**(0.5g,0.001mol),differentsubstitutedsulphonylchlorides(0.001mol)andtriethylamine(0.57g,0.003moles)werestirredin dry methylene chloride (10 mL) under N_2 atmosphere at room temperature for 12 h.ThereactionwasmonitoredbyTLC.Afterreactioncompletion,themixturewas washedwithwaterandbrinesolution.Methylenechloridelayerwasdriedover anhydrousNa_2SO_4andevaporatedundervacuum.Theresiduewaspurifiedbycolumnchromatographyusingpetroleumether:ethylacetateaseluent(7:3)togetSulphonamide dihydroquinolinenucleus**[4a-h]**ingoodyield**(scheme2.1)**.

Results and Discussion

Inthiswork,pharmacologicallyimportantnoveldihydroquinoline derivativeswere synthesizedbytheacetylationreactionof3-Aminophenol,cyclisationofacylatedaminophenolacetamidefollowedby substitution of o-phenylenediaminetoget intermediate**[3].**Compound**[3]**wasreacted withvarioussubstitutedsulphonylchloridesinordertogetthedihydroquinolinederivativeswithsulphonamidemoiety**[4a-h].**

The structures of the newly synthesized compounds were established by spectroscopicmethodsforinstance FT-IR, ^{1}HNMR, ^{13}CNMR andLCMS orMass spectra.

Finally, all the synthesized compounds were evaluated for their *in-vitro* Antibacterial,Anthelmintic,Anti-inflammatoryandAntihyperlipidemicactivity.

Spectralinterpretationofthetitlecompounds(4a-h)

N-[1-(2-Methanesulfonylamino-phenyl)-4-methyl-2-oxo-1,2-dihydro-quinolin-7-yl]acetamide[4a]

IR: νmax/cm^{-1}:3340 (N-H), 2228 (CN), 1698 (CO), 1342–1140 (CF stretching) ;**^{1}H-NMR($CDCl_3$)δ:**7.34-7.28(d,*J*=8.7Hz,1H,Ar-H),7.26-7.12(m,7H,Ar-H&NH),6.98-6.96 (d,*J*=8.3 Hz,1H, Ar-H),6.73-6.71 (d,*J*=8.3Hz,1H, Ar-H), 2.98(s,3H,$COCH_3$),2.36(s,3H,CH_3),2.16(s,3H,CH_3);**^{13}C-NMR ($CDCl_3$)δ:**163.25,135.75,132.29,129.97,129.40,122.92,118.34,114.30, 55.57,28.27,22.27;**MS:***m/z*=Cal.385.44(Found386.1)(M+1);**CHN analysis:**Calculatedfor:$C_{19}H_{19}N_3O_4S$;Calculated:C,59.21%;H,4.97%;N,10.90%;Observed:C, 59.19%; H,4.95%; N, 10.88%.

N-{4-Methyl-2-oxo-1-[2-toluene-4-sulfonylamino)-phenyl]-4-methyl-2-oxo-1,2-dihydro-quinolin-7-yl}-acetamide[4b]

IR:νmax/cm^{-1}:3340(N-H),2228(CN),1698 (CO),1342–1140(CFstretching)**^{1}H-NMR($CDCl_3$)δ:**7.74-7.70(m, 4H,Ar-H),7.35-7.31 (m,4H,Ar-H), 7.27-7.26(d,*J*=8.3Hz,1H,Ar-H),6.99-6.97(t,2H,Ar-H),6.96–6.88(m,5H,Ar-H),2.58 (s,3H,$COCH_3$),2.36(s,3H,CH_3),2.16(s,3H,CH_3);**^{13}C-NMR($CDCl_3$) δ:**173.28, 170.45, 163.80, 161.33, 154.55, 130.71, 130.63, 126.32, 126.24, 123.55, 123.52,119.57,119.35,114.90,114.66,107.79,80.08,43.10,28.27,22.27;

MS: *m/z* = Cal. 461.53; Found 462.2(M+1) ; **Elementalanalysis:** Calculated for: $C_{25}H_{23}N_3O_4S$; Calculated: C, 65.06 %; H, 5.02%;N,9.10%;Observed: C, 65.04%; H, 5.00%; N, 9.08%.

N-[1-(2-benzenesulfonylamino-phenyl)-4-methyl-2-oxo-1,2-dihydro-quinolin-7-yl}-acetamide[4c]

IR: νmax/cm^{-1}:3340 (N-H), 2228 (CN), 1698 (CO), 1342–1140 (CF stretching) ;**^{1}H-NMR($CDCl_3$)δ:**7.43-7.29(d,*J*=8.7Hz,4H,Ar-H),7.22-7.18(m,8H, Ar-H&NH),6.96-6.94(d,*J*=8.3Hz,1H,Ar-H),6.72-6.69(d,*J*=8.3Hz,1H,Ar-H),2.53(s,3H,CH_3),2.17(s,3H,CH_3);**^{13}C-NMR($CDCl_3$)δ:** 169.3,141.2, 138.3, 134.8, 128.7 CF^3, 125.9, 124.6, 115.9, 104.9, 28.7, 27.8; HPLC: 100% purity;**MS:***m/z*=Cal.447.51;Found448.0(M+1);**Elementalanalysis:**Calculatedfor:$C_{24}H_{21}N_3O_4S$;Calculated:C,64.41%;H,4.73%;N,9.39%;Observed:C,64.39%;H,4.71%;N,9.37%.

N-{1-[2-(6-Chloro-pyridine-2-sulfonylamino)-phenyl]-4-methyl-2-oxo-1,2-dihydro quinolin-7-yl}-acetamide[4d]

IR: νmax/cm^{-1}:3340 (N-H), 2228 (CN), 1698 (CO), 1342–1140 (CF stretching) ;**^{1}H-NMR(CDCl$_3$)δ:**7.43-7.29(d,*J*=8.7Hz,4H,Ar-H),7.22-7.18(m,8H, Ar-H&NH),6.96-6.94(d,*J*=8.3Hz,1H,Ar-H),6.72-6.69(d,*J*=8.3Hz,1H,ArH),2.53(s,3H,CH_3),2.17(s,3H,CH_3);**^{13}C-NMR(CDCl$_3$)δ:** 169.3,141.2,138.3,134.8,128.7CF_3,125.9,124.6,115.9,104.9,28.7,27.8;**HPLC:**100% purity ;**MS:** *m/z* = Cal. 482.94; Found 483.0 (M+1) ; **Elementalanalysis:**Calculatedfor:$C_{23}H_{19}N_4O_4SCl$;Calculated:C,57.20%;H,3.97%;N,11.60%;Observed: C, 57.18%; H, 3.95%; N, 11.58%.

N-{1-[2-(4-tert-butylphenylsulfonamido)-phenyl]-4-methyl-2-oxo-1,2-dihydroquinolin-7-yl} acetamide[4e]

IR:νmax/cm^{-1}:3340(N-H),2228(CN),1698(CO),1342–1140(CFstretching);**^{1}H-NMR(CDCl$_3$)δ:**8.08(s,1H,Ar-H),7.78-7.74(m,4H,Ar-H),7.56-7.54(d,*J*=8.0Hz,1H,Ar-H), 7.35(s,1H, Ar-H),7.34(s, 1H,Ar-H),7.23(s,1H,Ar-H), 6.94-6.92(t,1H,Ar-H),6.79-6.74(t,1H,Ar-H),6.61-6.60(d,*J*=4.0Hz,1H,Ar-H),6.35 (s,1H,ArH),4.0(s,1H,NH),2.42(s,3H,CH_3),2.04(s,3H,CH_3),1.35(s,9H,$(CH_3)_3$);**^{13}C-NMR(CDCl$_3$)δ:**168.9,158.6,154.5,147.5,138.8,137.3,136.6,131.6,130.5, 128.0, 127.3, 125.3, 122.7, 120.7, 119.6, 119.0, 117.2, 111.0, 110.7, 34.7, 31.3,24.0, 19.0.

N-{4-methyl-1-[2-(4-nitrophenylsulfonamido)-phenyl]-2-oxo-1,2-dihydroquinolin-7-yl)}acetamide[4f]

IR:νmax/cm^{-1}:3340(N-H),2228(CN),1698(CO),1342–1140(CFstretching);**^{1}H-NMR(CDCl$_3$)δ:**8.39-8.36 (d,*J*=8.0Hz,2H,Ar-H), 8.12-8.10(m,3H,Ar-H),7.567.52(d,*J*=8.0Hz,4H,Ar-H),7.35(s,1H,Ar-H),7.34(s,1H,Ar-H),7.23(s,1H,Ar-H),6.94-6.92(t,1H,Ar-H),6.79-6.76(t,1H,Ar-H),6.61-6.60(d,*J*=4.0Hz,1H,Ar-H),6.35(s,1H,Ar-H),4.0(s,1H,NH),2.42(s,3H,CH_3),2.04(s,3H,CH_3); **^{13}C-NMR(CDCl$_3$) δ:**168.9, 158.6, 151.1,147.5, 145.8,138.6, 137.3, 131.6,130.5, 128.2,127.5,124.2,122.7,120.7,119.6,117.2,111.0, 110.7,24.0,19.0.

N-{1-[2-(4-fluorophenylsulfonamido)-phenyl]-4-methyl-2-oxo-1,2-dihydroquinolin-7-yl} acetamide[4g]

IR:νmax/cm^{-1}:3340(N-H),2228(CN),1698(CO),1342–1140(CFstretching);**^{1}H-NMR(CDCl$_3$) δ:**8.08 (s, 1H,Ar-H), 7.98-7.96(d, *J*=8.0Hz, 2H, Ar-H),7.56-7.54(d,*J*=8.0Hz, 1H,Ar-H),7.40-7.34 (m,4H, Ar-H),7.23 (s,1H, Ar-H), 6.94-6.92(t, 1H,Ar-H),6.79-6.76(t,1H, Ar-H),6.61-6.60(d,*J*=4.0Hz,1H,Ar-H), 6.35(s,1H, Ar-H),4.0(s, 1H,NH),2.42 (s,3H,CH_3), 2.04(s,3H, CH_3);**^{13}C-NMR (CDCl$_3$)δ:** 168.9,166.1,159.0,147.5,138.6,137.3,135.3,130.7, 130.5,127.3,122.7,120.7,119.6, 119.0, 117.2,115.8, 111.0, 110.7, 24.0, 19.0.

N-{1[2-(4-bromophenylsulfonamido)-phenyl]-4-methyl-2-oxo-1,2-dihydroquinolin-7-yl} acetamide[4h]

IR:νmax/cm^{-1}:3340(N-H),2228(CN),1698(CO),1342–1140(CFstretching);**^{1}H-NMR(CDCl$_3$)δ:**8.08(s,1H,Ar-H),7.89-7.88(m,4H,Ar-H),7.56-7.54(d, *J*=8.0Hz,1H,Ar-H), 7.35(s,1H, Ar-H),7.34(s, 1H,Ar-H),7.23(s,1H,Ar-H), 6.94-6.92(t,1H,Ar-H),6.79-6.76(t,1H,Ar-H),6.61-6.60(d,*J*=4.0Hz,1H,Ar-H),6.35 (s,1H,ArH),4.0(s,1H,NH),2.42(s,3H,CH_3),2.04(s,3H,CH_3);**^{13}C-NMR(CDCl$_3$)δ:**168.9,159.6,147.5,138.6,138.7,131.9,131.6,130.5,129.5,127.5,127.3,122.7,120.7,119.6,119.0,117.2,111.0,110.7,24.0,19.0.

Conclusion

In conclusion, the study successfully synthesized and characterized a series of 1,2-dihydroquinoline sulphonamides through a well-defined synthetic route. The characterization of these compounds confirmed their chemical structures and purity. Pharmacological evaluations revealed that the synthesized sulphonamides exhibit significant antibacterial, anthelmintic, anti-inflammatory, and antihyperlipidemic activities. These findings underscore the potential of 1,2-dihydroquinoline sulphonamides as versatile pharmacological agents. Future research could explore the mechanisms underlying their biological activities and their efficacy in clinical applications,

potentially leading to the development of new therapeutic options in various medical fields.

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