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PHARMACOGNOSY

Dr. KUNTAL DAS

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PRAKASHAN
ADVANCEMENT OF KNOWLEDGE

A TEXT BOOK OF

PHARMACOGNOSY

FIRST YEAR D. PHARM.
AS PER PCI EDUCATION REGULATIONS
(E.R. 2020)

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Dept. of Pharmacognosy and Natural Product Chemistry
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Bangalore-35

Course Outcomes: Upon successful completion of this course, the students will be abl to:

1. Identify the important/common crude drugs of natural origin.
2. Describe the uses of herbs in nutraceuticals and cosmeceuticals.
3. Discuss the principles of alternative system of medicines.
4. Describe the importance of quality control of drugs of natural origin.

This Pharmacognosy text book has listed chapter wise brief description for the readers.

Chapter-1: This topic is mainly dealing with the Definition, history, present status an scope of Pharmacognosy. The chapter has highlighted on study of Pharmacognosy witl respect to origination, current status, various scopes including modern scopes are discusse for Pharmacognosy.

Chapter-2: This topic has described about classification of crude drugs with respect t alphabetical, taxonomical, morphological, pharmacological, chemical and chemotaxonomica classifications along with suitable examples.

Chapter-3: The topic of this chapter is very important that gave the preliminary ide about the quality control of crude drugs. It deals with the different methods of adulterations drug evaluation with their importance. These are the basic parts of the herbal dru standardization.

Chapter-4: This part has discussed about brief outline of occurrence, distribution isolation, general identification tests, therapeutic activity and pharmaceutical applications o some important plant secondary metabolites *viz.* alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.

Chapter-5: This chapter is the major part that covered 45% of the syllabus. It has described about biological source, chemical constituents and therapeutic efficacy of some important selected herbal crude drugs based on the categories of therapeutic efficacy.

Chapter-6: This chapter described the importance of plant originated fibers and their applications in surgical dressings, with special interest of sutures (Surgical Catgut and Ligatures).

Chapter-7: This chapter is the new addition in the syllabus that deals with the basic principle involved in the traditional medicine systems like; Ayurveda, Siddha, Unani and Homeopathy and also some preparation of Ayurvedic formulations.

Chapter-8: This chapter is a new addition with respect to the Role of medicinal and aromatic plants in national economy and their export potential.

Chapter-9: This chapter is a new addition that deals with herbs as health food. It specifically introduced with the details of nutraceutical, their classifications and their therapeutic applications in brief.

Krupanidhi College of Pharmacy IAEC Date: 29/10/22

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Syllabus

PHARMACOGNOSY – THEORY

Course Code: ER20-13T **75 Hours (3 Hours/wee**

Chapter	Topic		Hour
1.	Definition, history, Present Status and Scope of Pharmacognosy		2
2.	**Classification of drugs:** • Alphabetical • Taxonomical • Morphological • Pharmacological • Chemical • Chemo-taxonomical		4
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4.	Brief outline of occurrence, distribution, isolation, identification tests, therapeutic activity and pharmaceutical applications of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.		6
5.	Biological source, chemical constituents and therapeutic efficacy of the following categories of crude drugs.		30
	Laxatives	Aloe, Castor oil, Ispaghula, Senna	
	Cardiotonic	Digitalis, Arjuna	
	Carminatives and G.I. regulators	Coriander, Fennel, Cardamom, Ginger, Clove, Black Pepper, Asafoetida, Nutmeg, Cinnamon	
	Astringents	Myrobalan, Black Catechu, Pale Catechu	
	Drugs acting on nervous system	Hyoscyamus, Belladonna, Ephedra, Opium, Tea leaves, Coffee seeds, Coca	
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Herbal Drug Technology

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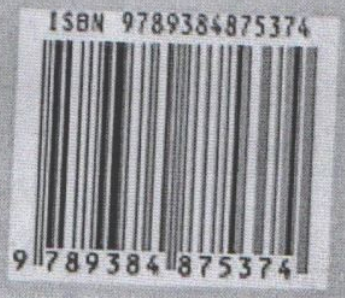

HERBAL DRUG TECHNOLOGY

(A complete text book for B.Pharm VIth semester students as per syllabus prescribed by Pharmacy Council of India)

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Preface...

With the passage of time, the subject Pharmacognosy has evolved as multidisciplinary subject covering plant drug standardization, phytochemistry, plant biotechnology, nutraceuticals, cosmeceuticals, herbal drug interactions, clinical trials, novel drug delivery systems, etc. The demand for herbal raw material, herbal products / preparations, nutraceuticals / dietary supplements and herbal based cosmeceuticals has increased enormously worldwide. The reasons behind the increase in demand of such products are the growing awareness about side effects of allopathic medicines and safety with medicinal benefits of herbal products.The herbal drug industries are rapidly growing to meet demands of consumers, and this has created huge pressure on industries to set up their R & D sectors for developing quality herbal products to meet global standardization processes. The regulatory authorities have laid down regulations for good manufacturing practices and good clinical practices of herbal products.

This book has been designed to cover syllabus of Herbal Drug Technology for B. Pharmacy VIth semester students as per Pharmacy Council of India. It comprises 13 chapters of 5 units from introduction of herbal products to current relevant concepts of Pharmacognosy. The book focuses on development of herbal formulations by traditional systems (Ayurveda, Unani or Siddha), conventional methods (tablets, capsules, syrups, etc.) and novel drug delivery systems (Phytosomes). It covers the use of herbal raw materials / herbal excipients in herbal industries producing standardized galenicals (extracts, powders, tinctures, etc.), traditional medicines (AYUSH products), phytopharmaceuticals, herbal teas, nutraceuticals, health or functional foods, dietary supplements, herbal cosmetics, formulated drugs containing isolated pure active compounds (quinine, reserpine, digoxin, etc.) and semisynthetic drugs made from intermediates (citral, diosgenin, etc.). The roles and responsibilities of National regulatory authorities, and Schedule T and Z applicable to herbal drugs have been included in this book. The guidelines prescribed by global authorities such as WHO and ICH for the assessment of herbal drugs have also been discussed. The book emphasises challenges and problems associated with herbal products such as drug interactions, stability testing and patent related issues in detail.

5 June 2020

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T2-PANA-012

Development of new stability indicating high performance liquid cromatography method for the simultaneous estimation of Empaglifocin, Linagliptin and Metformine combination in bulk and marketed formulations

Sonam Prabhu*, Kavitha AN, Sudha Chaitanya

Department of Quality Assurance, Krupanidhi College of Pharmacy, Bengaluru

ABSTRACT

The main objective of the present research work was to develop and validate HPLC method for simultaneous estimation of Empaglifocin, Linagliptin and Metformin combination in bulk and marketed formulations. A liquid chromatographic system equipped with a C18 column (250X4.6mm,2.5µm) as stationary phase, a Gradient pump and photodiode array detector was used in the present study. The mobile phase used was a mixture solution of 40% Phosphate buffer and 60% Acetonitrile at a flow rate of 0.1 ml/min. The detection was performed at 270 nm. EM power Pro software was used to analyze experimental observations. The calibration plot was linear over the concentration range of 0.5-3µg/ml with, LOD & LOQ for Empaglifocin, Linagliptin and Metformin were found to be 0.02 & 0.06µg/ml, 0.01 & 0.03µg/ml, and 0.98 & 2.98µg/ml respectively. Accuracy and Precision of the proposed method was evaluated by recovery studies, where the % recovery of Empaglifocin, Linagliptin and Metformin was found to be 100.10%, 99.74% and 99.56% respectively. The performance of the proposed method was validated for linearity, accuracy, precision, and robustness. The proposed method was successfully validated for the simultaneous estimation of Empaglifocin, Linagliptin and Metformin combination in bulk and marketed formulations. The developed HPLC method can be applied for simultaneous estimation of Empaglifocin, Linagliptin and Metformin combination in bulk and marketed formulations.

Keywords: HPLC, ICH, Empaglifocin, Linagliptin, Metformin

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T1-PP-019

Effect of Human Carboxylesterase 1 (hCES1) Genetic Variations on Treatment Response to Dabigatran Etexilate and Clopidogrel in Patients with Thromboembolic Disorders - A Systematic Review and Meta-analysis

Miss. Shiji John, Miss. Shyno Abraham, Samuel Gideon George P

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ABSTRACT

Several studies have demonstrated that the effect of non-synonymous single nucleotide polymorphisms (nsSNP) of the human carboxylesterase (hCES) gene have altered the pharmacokinetics and/or clinical response of the drug. The safety and efficacy of hCES enzyme metabolized anti-platelets such as Dabigatran Etexilate Mesylate and Clopidogrel, in subjects carrying the Non-synonymous genetic variations remain controversial. In this study, we compared the effect of hCES1 enzyme genetic variation of Dabigatran and Clopidogrel by a systematic review and meta-analysis. Clinicians will be able to tailor as well as customize the dose & frequency to the needs of individual patients through careful assessment and routine genotyping.
Aim – To compare the effects of Human Carboxylesterase 1 (hCES1) Genetic polymorphisms on Treatment Response to Dabigatran Etexilate and Clopidogrel. A literature search was performed using PubMed, Embase, Cochrane Central Register of Controlled Trials, Google Scholar, Medscape, LILACS and Scopus databases. The study included patients prescribed with Dabigatran Etexilate and Clopidogrel in various doses for thromboembolic disorders. Data synthesis included assessment of Hardy Weinberg Equilibrium (HWE) value followed by assessment of inter-rater agreement by 3 individual reviewers using Rayyan QCRI and heterogeneity assessment along with other statistical analysis was performed using Cochrane Review Manager 5.0 and R 4.0.3. The reported outcomes were systematically reviewed. A total of 6 case-control studies were included matching all meta-analysis inclusion/exclusion criteria. In case of Dabigatran Etexilate, the control group was associated with decreased risk of bleeding when compared with the case group for rs2244613 (nsSNP), wherein $I2 = 54\%$ with 95% confidence interval and $p<0.1$, this indicated that statistical significance between rs. 2244613 and risk of bleeding were observed. However, significant statistical association between nsSNP and Clopidogrel associated bleeding was not observed. According to the findings of our Meta-analysis, due to the limited number of sample sizes and constrained number of studies conducted, analysis was carried out for rs2244613 (nsSNP) which revealed that Dabigatran had lower risk of bleeding in homozygous population and a promising as well as a favorable safety profile. Whereas, in case of Clopidogrel, theoretical studies shows that CES1 genetic variations increases the efficacy of Clopidogrel-active metabolite, but statistical results were insignificant and hence further studies have to be conducted to prove the theoretical statement.

Keywords - Carboxylesterase, Clopidogrel, Dabigatran Etexilate, Genetic, Genetic Variation, Meta-analysis, Polymorphism, rs2244613, Single Nucleotide.

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Implementation of XGboost- a machine learning algorithm to optimize the screened formulations of opioid analgesic proniosomal gel

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ABSTRACT

The abuse-forming potential of opioid analgesics is a matter of concern for formulators in this work. An opioid analgesic, tapentadol hydrochloride, is repurposed as a Proniosomal gel using the principles of Parameter Sensitivity Analysis (PSA) assisted Main Effects Screening Design (MESD). The screened experiments were further computed with XG Boost, a machine learning algorithm for optimizing the best formulator output given by PSA-assisted MESD. This work showcases the effectiveness of computational technologies and their potential applications for the formulation design and optimization, which can be easily implemented and leveraged for faster and better formulation development.

Keywords: Tapentadol hydrochloride, Parameter sensitivity analysis, XGboost, Main effect screening design, Proniosomal gel.

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T2-PANA-019

Analytical method development and validation of Aripiprazole in pharmaceutical formulations

Preethi S[1], Prasanta D[2], Kalyani A[2], Ranganath MR[2], Litha T[1], Rajendra SV[3], Rudhran N[1]

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ABSTRACT

Aripiprazole, a benzisoxazole derivative, is an atypical antipsychotic that acts as a partial agonist on dopamine (D2) receptors and an antagonist on serotonin (5-HT2A) receptors. It is chemically7-(4-bromobutoxy)-3,4-dihydro-1H-quinolin-2-one. Rather than the existing one, the goal of this study is to develop a simple, accurate, precise, and robust validated analytical procedure using reverse phase high performance liquid chromatography (RP-HPLC) that can be extended to its formulations and bulk samples. A Waters 1525 chromatographic system (Empower 3 software) equipped with a Water 2487 Dual λ detector was used for the study. The Waters C-18 column (250x 4.6 mm, particle size 5 µm, Waters, USA) was used as a stationary phase. The mobile phase consisted of 0.1% orthophosphoric acid (pH adjusted to 3.0 with 0.1 M HCl), acetonitrile and methanol at a ratio of 40:50:10% v/v. The mobile phase was filtered through a 0.45 µm HPLC filtration assembly, degassed by sonication and was pumped by an isocratic elution process at a flow rate of 1.0 ml/minute. An injection volume of 20 µL was used for the analysis and validation of aripiprazole. The detection was carried out at 255 nm. A 1000 µg/ml solution of aripiprazole stock solution in the mobile phase was suitably diluted to a working standard solution of 100 µg/ml. For linearity determination, 6 aliquots from the working standard solution were suitably diluted using a mobile phase to get a concentration range of 30-50 µg/ml and were injected into the chromatographic column. Accuracy was determined by spiking three different concentrations (50-150%) at target levels of 30, 40 and 50 µg/ml and closeness to the same value was determined. Robustness was calculated by changing the flow rates at two levels, 0.8 and 1ml/min. Precision was determined by injecting a 30 g/ml solution repeatedly, and inter-day variability was determined by injecting three different concentrations of 30, 40, and 50 g/ml on three consecutive days and calculating the relative standard deviation. LOD and LOQ were also determined. The retention time was found to be 2.7. The linearity established by the standard calibration curve was found to be between 30- 50 µg/ml. The correlation coefficient was found to be 0.9978. The limit of detection was found to be 0.000105 and the limit of quantification was found to be 0.00032. For precision, the RSD was found to be 0.87 for repeatability and for intraday, the RSD values ranged between 1.04, 0.36 and 0.28. The accuracy test at three different concentration levels indicates a mean recovery of 99.42, 98.43 and 100.54%. Robustness was discovered at two different flow and wavelength rates, and the retention time was found to be 2.1 and 2.7 seconds, respectively. The simple isocratic reverse phase LC method developed for quantitative analysis of aripiprazole in bulk samples and pharmaceutical dosage forms is precise, accurate, linear, robust, and specific. Satisfactory results were obtained from validation of the method.

Keywords: Aripiprazole, Precise, Concentration, Analysis

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T1-PCOL-016

Evaluation of anti-osteoporotic activity of Ethanolic Extract of *Ipomoea batatas* (L).lam tubers in rats

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ABSTRACT

Osteoporosis may be described as systemic skeletal sickness characterized through low bone mass and micro architectural deterioration of bony tissue with a consequent growth in bone fragility and susceptibility to fractures. The goal of the prevailing studies is to assess the anti-osteoporotic activity of ethanolic extract of Ipomoea batatas L. Lam tubers in Wistar albino rats. Glucocorticoid and Heparin were used as positive control to produce osteoporosis in Wistar albino rats. Ethanolic extract of Ipomoea batatas L. Lam tubers at doses 200 and 400 mg/kg were used to treat against osteoporosis. The study included physical parameters like bone weight, bone volume, bone density and biochemical parameters like alkaline phosphatase, serum calcium, serum phosphorous, urine calcium, urine phosphorous and In-vitro antioxidant activity was also conducted in addition to this. The ethanolic extract of Ipomoea batatas L. Lam tubers has exhibited several phytochemical constituents such as carbohydrates, flavonoids, tannins and saponins. The ethanolic extract of Ipomoea batatas L. Lam tubers was able to show anti-osteoporotic activity in glucocorticoid and heparin induced osteoporosis in Wistar albino rats. Treatment with ethanolic extract of Ipomoea batatas L. Lam tubers at a dose of 400 mg/kg altered bone weight, bone volume, bone density and showed significant changes in biochemical parameters like alkaline phosphatase, serum calcium, serum phosphorous, urine calcium, urine phosphorous. The tuber extracts additionally possess antioxidant activity with IC50 value ~ 20 µg/ml in DPPH scavenging activity. Ethanolic extract of Ipomoea batatas L. Lam tubers may possess anti-osteoporotic and antioxidant activity and it can be used as a combination therapy with potent and novel anti-osteoporotic molecules.

Keywords: Osteoporosis, skeletal sickness, antioxidant, bone.

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T2-PANA-022

Molecular Docking and ADMET Prediction Studies of Some Novel 1,4 dihydropyridine Derivatives as antihypertensive agent

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ABSTRACT

Hypertension a universal public health hazard and ranked 3rd as a leading cause of mortality and disability. It affects approximately 26% of the population worldwide, nearly 45% of deaths by heart disease and 51% of deaths by stroke are due to hypertension; accounting for 9.4 million deaths worldwide every year. In India, its prevalence varies from 20-40% in urban to 12-17% in rural areas. It is estimated that the prevalence of hypertension (HTN) might rise to 214 million by 2025. For the management of hypertension various classes of antihypertensive drugs are available such as diuretics, β-blockers (BB), α blockers, calcium channel blockers (CCBs), angiotensin converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs). In recent times, dihydropyridines, a class of L-type of voltage –gated calcium channel blockers (CCB) are being prescribed more commonly in a number of eastern Asian countries. It is favorable choice for monotherapy or in combined dosage form in the treatment of hypertension and may provide specific benefits beyond BP lowering. In this study, a molecular docking-based approach was utilized for identifying and evaluating potential L- type calcium channel blockers by designing 10 novel analogues of 1,4- Dihydropyridine. Molecular docking simulation of ten (10) molecules of different 3-ethyl 5-methyl 2-(chloromethyl)-1,4-dihydro-6-methyl-4-phenylpyridine-3,5-dicarboxylate analogues with human voltage-dependent L Type calcium channel alpha1 subunit (PDB ID: 3LV3) retrieved from protein data bank was carried out to evaluate their theoretical binding affinities. The chemical structure of the molecules was accurately drawn using Chem Draw Ultra software, and energy minimization was done using MOE software followed by docking operation using Auto dock tools1.5.6 software. Molecule 3 (M3) with the highest binding affinity of – 7.26 kcal/mol was selected as the lead molecule. In-silico ADME and drug likeness prediction of the molecules showed good pharmacokinetic properties. The outcome of the present research strengthens the relevance of these compounds as promising lead candidates for the treatment of hypertension which could help pharmaceutical professionals in further designing and synthesis of more potent drug candidates. Moreover, the research also encouraged the in vivo and in vitro evaluation study for the proposed designed compounds to validate the computational findings.

Keywords: Molecular docking, ADMET, antihypertensive agent.

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Microsponges mediated delivery of mesalmine for anti-inflamatory therapy of colon

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ABSTRACT

Colon targeted drug delivery systems have been developed to increase site-specific drug delivery, to prevent pre-systemic drug metabolism, achieve localized drug therapy, and to reduce dose and dose-related side effects associated with conventional oral drug therapy. The aim of the present investigation utilizes micro sponges as a carrier system to target mesalamine in the inflammatory conditions of the colon. The micro sponges were prepared by quasi-emulsion solvent diffusion method using the polymers Eudragit R100, S100, RS100 and RL100 alone and in combinations, where polyvinyl alcohol was used as a surfactant. Drug-excipient compatibility was assessed by IR spectroscopy. All the formulations were evaluated for product yield, drug content, in vitro drug release studies etc. The in vitro drug release data was fitted to various models to check the kinetics and mechanism of drug release. Short-term stability studies were conducted for a period of 3 months to assess changes in the formulation. Compatibility studies showed that there was no chemical interaction between the drug and the excipients. The drug content of micro sponges was found to be 90 ± 0.16 to 95 ± 0.46%. The particle size ranged between 158µm to 340µm. The entrapment efficiency was found to be 62 ± 0.05 to 84 ± 0.46%. The in vitro drug release studies in phosphate buffer pH 6.8 showed the drug release in the range of 76.12 ± 0.21-100.01 ± 0.12% for 6 h. The drug release kinetics indicated a zero-order drug release and a diffusion-controlled drug release for all the formulations. Surface morphology studies of the selected formula (F7) revealed that the particles were almost spherical with an even surface. Particle size analysis of the selected formula by a dynamic light scattering technique exhibited a particle size of 7.4 µm. The stability studies indicated that there were no appreciable changes in the drug content and the entrapment efficiency and it was almost in accordance with the initial results. The micro sponges of mesalamine by quasi emulsion using Eudragit polymers were found to be a successful approach as it resulted in products with good physicochemical properties, drug entrapment efficiency and controlled drug release over a period of 6 h. Thus, these drug delivery systems could ensure effective localized therapy in inflammatory conditions of the colon.

Keywords: Mesalamine, Eudragit, Micro sponges, Colon, Targeting, Inflammatory

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Psychotropic Drug Usage and The Risk of Respiratory Disorders in Patients with Psychiatric Disturbances - A Cross Sectional Study

Elsa Jacob, Abhirami Eby, Samuel Gideon George P *

Department of Pharmacy Practice. Krupanidhi College of Pharmacy, Bengaluru

ABSTRACT

Psychotropic drug usage was reported to be associated with increased risk for respiratory disorders. A cross-sectional study was conducted using a validated questionnaire among patients on psychotropic medications or their caregivers at a community pharmacy set-up. The study evaluated the effect of various psychotropic agents on the pulmonary function to identify the psychotropic drug class that is most commonly associated with the risk of respiratory disorders. Since psychotropic medications have safety concerns for usage in general population, their use in people with coronavirus disease (COVID-19) is considered challenging. The study may also serve to draw evidence based practical recommendations for the treatment of people with COVID-19.

AIM: To determine the association between psychotropic drug usage and the risk of respiratory disorders in patients with psychiatric disturbances. A 10-item containing questionnaire was designed to capture clinical information regarding psychotropic drug use and respiratory disorders. Internal consistency and reproducibility were determined using Cronbach's alpha and intra class correlation coefficient respectively. Validated questionnaire was administered to patients or caregivers at a community pharmacy setup and data was collected through electronic data capture. All captured data were summarized descriptively and statistically analysed using R Studio 4.0.

RESULTS: Cronbach's alpha and ICC values were found to be 0.92 and 0.85 respectively. In a sample of 198 patients, benzodiazepines were the commonly used medication among the population (43.9%) followed by SSRI (21.2%), anti-psychotics (15.1%), mood stabilizers (7.6%) and others (12.2%). Statistically significant association was observed between history of benzodiazepine usage, second generation anti-psychotics (SGA) and respiratory disorders (OR 1.56 [1.1 – 2.3, P<0.1]). However, the use of first-generation antipsychotics (FGA) was found to be less associated with respiratory infections among anti-psychotics. History of benzodiazepine and SGA usage were found to be associated significantly with respiratory disorders including pneumonia and acute respiratory distress. Hence patients on psychotropic medications should be monitored for respiratory symptoms and choice of anti- psychotic medications should be made on existing clinical evidence. The psychotropic drugs which were found to be safer through the study conducted can be chosen to help improve the quality of psychiatric care in people with COVID-19, also promoting an optimal management of the psychiatric condition without worsening the medical condition due to COVID-19.

Keywords: Psychotropic, antipsychotics, respiratory disorder, pneumonia, COVID-19

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Cross – sectional survey on assessment of awareness, attitude, risk perception and preventive behaviour of Indian public towards the COVID - 19 pandemic

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ABSTRACT

With an end goal to reduce the flare up of Coronavirus (COVID 19) adoption of unusual control measures were put on the residents by the government. Resident's adherence to these control measure plays an important role in the reduction of the current pandemic. The main objective of the study is to assess the awareness, attitude, knowledge, risk perception and preventive behaviours for COVID19 during the pandemic. A cross sectional online survey was conducted with a help of self-structured questionnaire developed via google forms and was made accessible via emails and social networking sites. Of the 538 responses, 39.1% of the participants retained strong awareness about the prevention of novel coronavirus transmission. Majority of the participants found a high degree (79.5%) of commitment to the national & local guidelines on preventive measures. Addition to this, participants were also unaware of the positive cases or home quarantined community in their vicinity which could lead to increased transmission. As the majority of the participants were health care professionals, investigations involving non-medical professions are required to understand on the adherence and attitude towards to the guidelines to prevent the transmission of novel coronavirus.

Keywords: Awareness, Attitude, COVID-19, Lockdown, Preventive behaviour, Risk perception

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