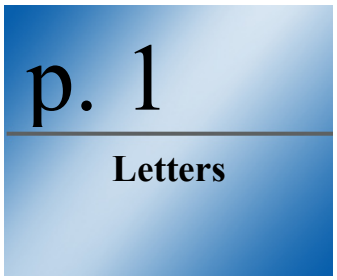
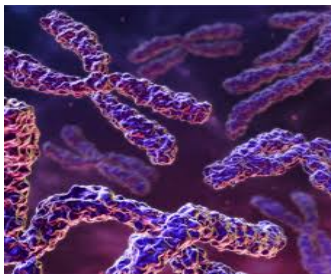
Graduation Research Projects Report

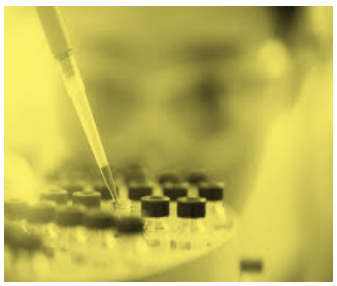
2019-2020

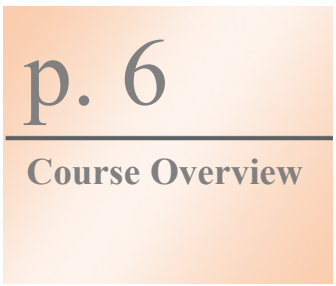

بسم الله الرحمن الرحيم

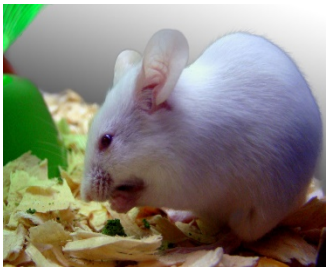
Contents











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2019-2020

أبنائي وبناتي طلاب وطالبات الكلية

يسرني أن أهنئكم بنجاحكم وتخرجكم، فلطالما كان للحظات التخرج وقع مؤثر في نفسي فهي لحظات مشحونة بالعواطف والإنجاز، كما أني أعلم تماماً كل ما مررتم به لكي تصلوا إلى هذه المرحلة. والآن تنظرون أنتم وأسركم للحظة الاحتفاء بالإنجاز والتطلع للمستقبل والتأمل في الماضي.

أبنائي وبناتي... أنتم دفعة استثنائية تخرجت في وضع استثنائي، وسيرتبط تخرجكم بذاكرتنا جميعاً . أغتنم الفرصة لأشيد بتميزكم وكفاءتكم وجهودكم المبذولة وعملكم المستمر. كما أشكر زملائي أعضاء هيئة التدريس على المشاركة في الإشراف على مشاريعكم التي نفخر بها جميعاً. لقد كان لجهودكم وتفانيكم في مشاريع التخرج بصمة واضحة لتحقيق أهداف كلية الصيدلة التعليمية والبحثية.

ومن حيث يؤسفني أن أعلمكم بتعذر إقامة يوم البحث العلمي لهذا العام نظراً لظروف تفشي وباء كورونا، فإنه يسرني أن أبلغكم بأن الكلية تفتح بابها لكم مجدداً للمشاركة في يوم البحث العلمي للعام القادم 2021 م وتقديم أبحاث تخرجكم ، وكذلك الحصول على ساعات تعليم مستمر وفرصة التنافس على الجوائز إن شاء الله.

لا يسعني ختاماً إلى تقديم التمنيات باستمرار النجاح والازدهار وتمام الصحة والعافية وزوال الغمة عن البلاد وتقبلوا خالص تحياتي.

عميد الكلية

أ.د. أوس بن إبراهيم الشمسان

أبنائي طلاب وطالبات بحث التخرج

طوى يومُ صحيفته وغادر...

.. وفي الساعات إيذان بآخر

بالأمس كنت أقف مبهورة بكم وأنتم تستعرضون مقترحاتكم البحثية فقد رأيت الحماس والثقة بالنفس والخطوات الأولى للبحث. واليوم وبالرغم من ظروف الجائحة التي نمر بها أكملتم مسيرتكم ونجحتم في بلوغ الهدف. وبالرغم من عدم إتاحة الفرصة لكم لعرض أبحاثكم إلا أنكم قد اكتسبتم معارف جديدة كالنقد والتحليل وجمع المعلومات وحل المشكلات وتعرفتم على أهمية البحث العلمي التي تنعكس بشكل كبير على المجتمع حيث تعمل على تحقيق التقدم والتطور.

وبعد، لا يسعني إلا أن أغتنم هذه المناسبة وأبارك لكم نجاحكم وأسأل الله التوفيق والسداد لنا ولكم جميعاً.

وكيلة كلية الصيدلة

أ.د. نورة بنت زومان الزومان

Dear Student,

The goal of the graduation project is to give you an opportunity to exhibit your knowledge, skills, techniques, and abilities that you have acquired and polished during your presence as an undergraduate student at the College of Pharmacy and to become responsible professional of competence and integrity in the area of health performance.

When setting graduation research criteria, our goals were to offer you the opportunity to choose your research area of interest, to empower yourself with key knowledge and skills, to advance in your career, to understand the research process, to learn lab techniques, to develop skills in results' interpretation and data analysis. Today, upon completion of your graduation project, it should fulfill all of these elements.

The ultimate goal of any researcher is to disseminate his work and make a substantial contribution to the public domain of science such as conference participation and publication in a prestigious journal. Therefore, the College of Pharmacy was keen to hold an annual forum to highlight research projects of final-year undergraduate and post graduate students. The event that students and faculty are waiting every year, to present their achievements, to share memories, and to compete on awards.

Unfortunately, this year, the tenth College of Pharmacy Research Day has been suspended. We were preparing to celebrate with you the tenth anniversary of the Research Day, but for the hard circumstances, and due to its suspension, we would like to congratulate all students on their success and we wish that you will participate in the upcoming Research Day.

In this College of Pharmacy Graduation Research Report, we present how you worked tirelessly from working in the lab, conducting research, writing manuscript, and presenting at conferences.

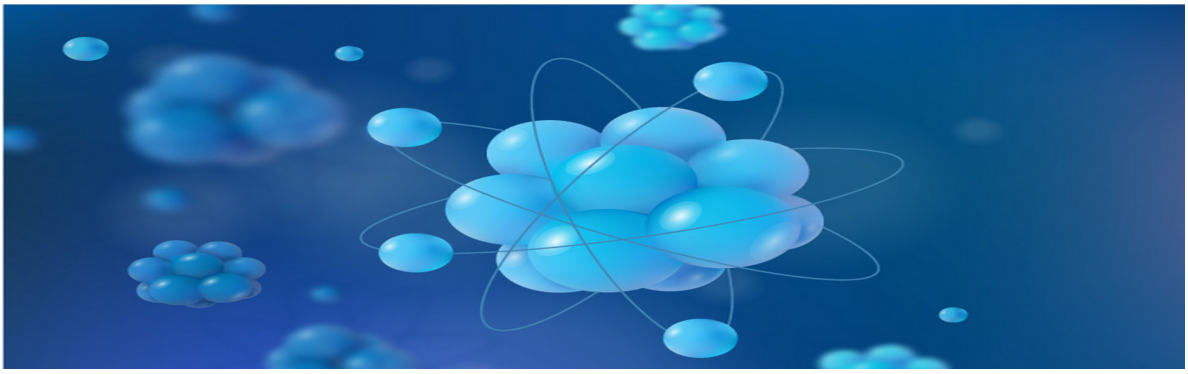
Finally, I wanted to take this opportunity to say thank you for all of your hard work and dedication. This past challenging year was filled with so many accomplishments because of our talented students and faculty.

I hope you enjoy the summer months.

Maha Meshal AlRasheed

Chair,

Graduation Research Committee
& the 10th College of Pharmacy Research Day Executive Committee



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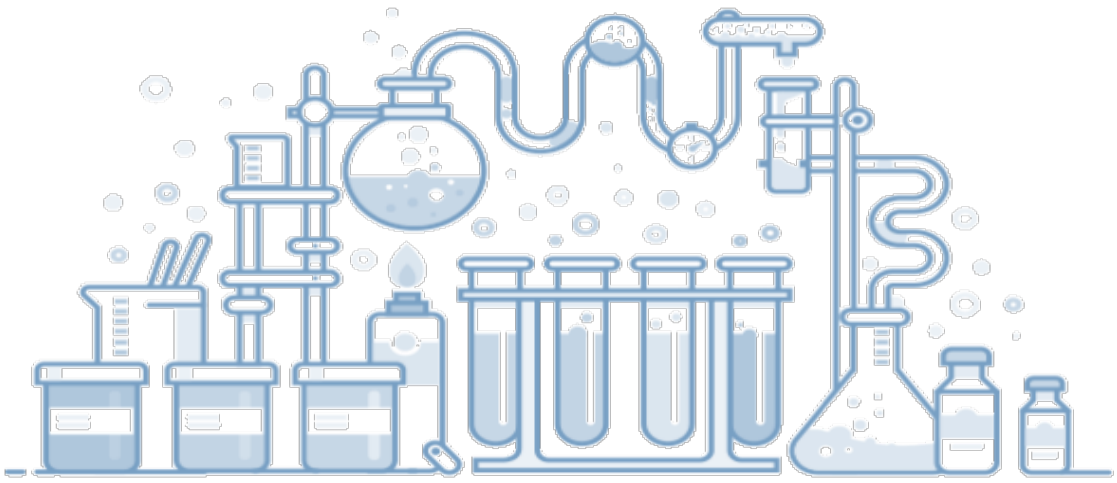

Although, the tenth College of Pharmacy Research Day preparation has been suspended, we would like to thank students for volunteering and participation in the event initial preparation.

Team

1. Alfaisal T.Faraj
2. Alanoud Z. Alshabanat
3. Aljoharah O. Alshabanah
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6. Alaa A. Alshaalan
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32. Osama S. Alamri
33. Abdulrahman Alshamrani
34. Maram H. Alanazi
35. Khalid F. Alonazi
36. Tareq Alshamrani
37. Asim A. Babaeer
38. Raghad B. Alammari
39. Mohammed A. AlQahtani
40. Ali M. AlQassem
41. Sarah K. Sayed
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4. Sarah k.Sayed

Scientific Team

1. Sara A. Almuhaini
2. Abdullah N. Alahmadi

The College of pharmacy graduation research courses (PHCL 490 and PHTR 495) are designed to provide students with the required skills to conduct a research project in a pharmacy sciences or pharmacy practice area under supervision during three semesters. The aim of these courses is to provide students with the skills and experiences necessary to conduct and complete a research project. The research has three parts: proposal presentation, abstract and presentation submission for final research, manuscript preparation as a research article for submission to a journal research period.

Assessment and evaluation

Students usually evaluated through two steps

a) During the course (90%): KSU supervisor will be using two evaluation forms for this purpose. In the proposal day, Proposal Presentation Evaluation Form will be used. In addition, criteria for evaluation during the course are available in the project assessment report.

b) During the Research Day (10%): External judges in the research day will assess each project individually and grades will be submitted

Due to the unusual circumstance and the Coronavirus pandemic, the tenth College of Pharmacy Research Day was suspended, and students were assessed based on the first point

Through this research-based courses, students should learn to be able to

- Articulate a clear research question or problem and formulate a hypothesis.
- Identify and demonstrate appropriate research methodologies and know when to use them.
- Know existing body of research relevant to their topic and explain how their project fits.
- Identify and ethics and responsible conduct in research
- Know and apply problem-solving skills to constructively address research setbacks
- Work collaboratively with other researchers, using listening and communication skills
- Reflect on their own research, identifying lessons learned, strengths, and ways to improve
- Explain their research to others in the field and to broader audiences through research presentations

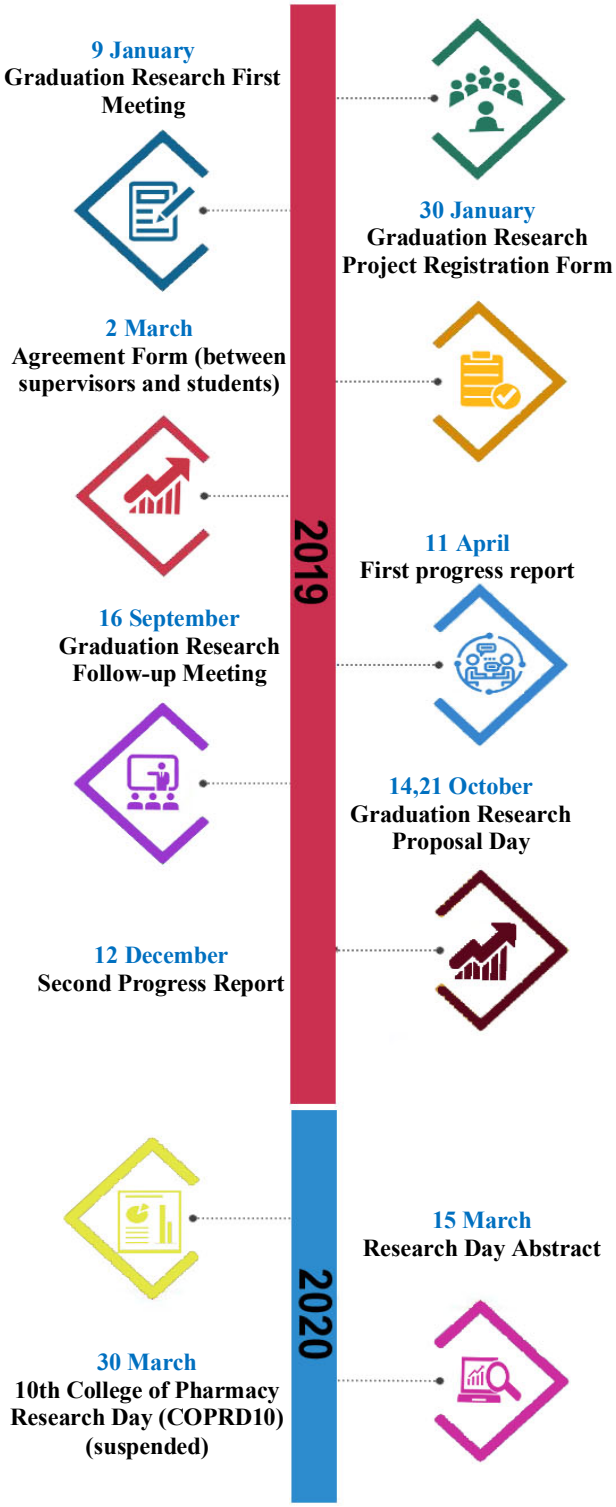
Graduation Research Activities

Each student has attended the following activity events during the graduation research journey. Also, an additional workshops and courses were offered by the College of Pharmacy and the Deanship of Scientific Research.

Graduation Research First Meeting: An Introductory Workshop

On the 9th of January 2019, an introductory workshop meeting was held for students enrolled in the graduation research course under the auspices of the College's Dean in the presence of students and faculty members. The course handbook presented outlined course objectives, student, and supervisor's responsibilities, important graduation research milestones, forms that the student must provide, and some important dates for the course activities. Additionally, an introductory presentation from each department's head was carried out describing each department interests, activities, faculty members specialty and research opportunities. The workshop lasted two hours and the total number of attendees was about 200.

Graduation Projects Timeline 2019-2020



Graduation Research Follow-up Meeting: Forum to Follow Graduation Research Progress

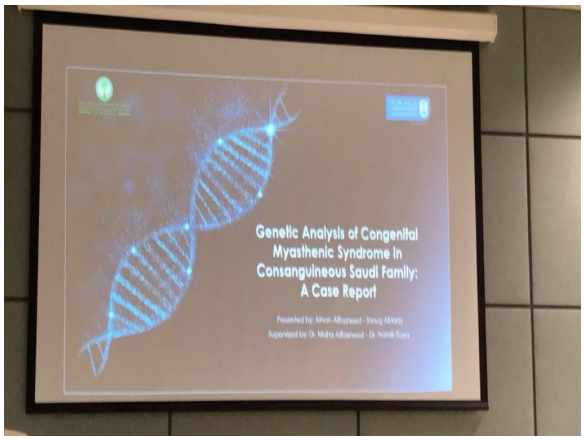
A follow-up meeting was carried out on the 16th of September 2019 aims to follow the graduation research journey to ensure the research progress, answer student's inquiries and work to solve research related problems and obstacles.

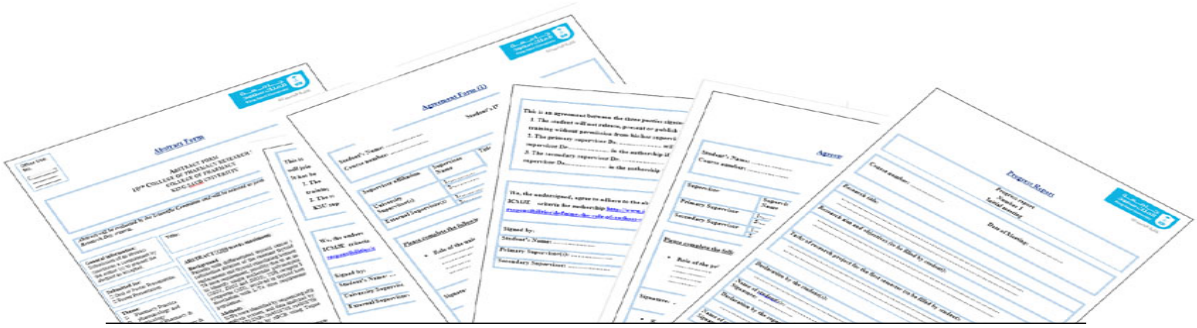
Graduation Research Proposal Day

89 research proposals were presented by students on October 14 and 21, 2019 for girls and boys respectively in the College of Pharmacy and in the presence of pharmacy faculty and research supervisors. Each project was given 10 minutes for presentation and questions. The day was under the Dean's auspice and sessions were moderated by Pharmacy faculty.

10th College of Pharmacy

Due to the unusual circumstances and as a result of the novel Coronavirus pandemic, the tenth College of Pharmacy Research Day, which was scheduled for the 30th of March, has been suspended until further notice.



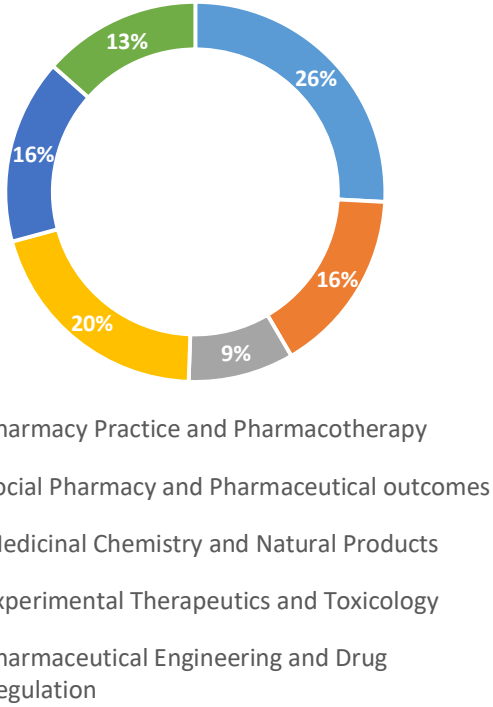


89

Graduation Research Projects

Graduation research projects were completed under 6 different research themes.

Graduation Projects per Research Theme



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Non-KSU Supervisors

110 supervisors were involved in the graduation research 2019-2020

99

KSU Supervisors

Each research student had the opportunity to select his supervisor. Students receive advice and guidance from their supervisors throughout their research period. The graduation research committee ensures that research students receive sufficient support and guidance to facilitate their success.

Prof. Namik Kaya, Senior Scientist

Department of Genetic, Cognitive Genetic Unit, KFSH&RC

169 Students

81 Boys

\+

88 Girls

169 students

Students worked hard and attentively under the supervision of supervisors from the college of pharmacy throughout a project's period to complete the graduation project. They went through the complex process of brainstorming ideas, keeping track of them, turning them into studies, trying them out in pilot studies, and writing a draft paper before reaching manuscript publication.

22 Sites

Project's KSU supervisors extended their capabilities through collaborative project work with faculty and scholars to better contribute to scientific outcome. They successfully partnered with leading academic and research institutions such as King Faisal Research Center, King Saud University Medical City, King Abdul-Aziz University Hospital, King Khalid University Hospital, King Fahad Medical City, Al-Amal Mental Health Complex and Community Pharmacies.

Student's Achievements

During the research period, students reached several accomplishments. Almost all students finished their projects succeffuly and prepared the first manuscript drafts. The list below shows some student's achievements.

Research Grants

1. Grant # URSP-5-20-20 (Heba Abu-Obaid), Undergraduate Research Support Program. Evidence for involvement of histamine in breast cancer related angiogenesis.

2. Grant # URSP-5-20 -27 (Monira alwhaibi), Undergraduate Research Support Program. 10000-20000 SAR. One year. Pharmacovigilance in healthcare education: students' knowledge, attitude and perception: A Cross-sectional study in Saudi Arabia.

3. Grant # URSP-5-20-21 (Layal Albdirat) Undergraduate Research Support Program. 10000-20000 SAR. Three months. The hepatoprotective effects of chrysinin animal model of non-alcoholic fatty liver. The impact on angiotensin converting enzyme2/angiotensin 1-7/Mas axis).

4. Grant # URSP (Abdulaziz alhossan), Deanship of scientific Research in King Saud University. 10,000 SAR. Evaluation of medication therapy management clinic implementation on over all medication use in a tertiary hospital: A Prospective Study.

5. Grant # URSP-4-19-139. (Nibras Alhazm), Undergraduate Research Support Program. 7000 SAR. Feasibility and of acceptability web-based patients reported outcome application in cancer patients during chemotherapy.

Student's Research Awards

1. Alhindi. Ghaida, BinEssa. Maryam, Alshamrani. Majd (2020). Knowledge, Attitude and Perception of Pharmacovigilance Among Health care Students in Saudi Arabia–A Pilot Study.2nd best pharmacy student organization poster award. DUPHAT. 25-27/2/2020. Dubai, United Arab Emirate.

2. Alrumikan, Norah. Almebki, Renad. 2020.Evaluating the effects of antibiotics sub-inhibitory doses on Pseudomonasa eruginosa quorum sensing dependent virulence and its phenotype. 2nd Place Best Pharmacy Student Quality Poster Award. DUPHAT. 25-27/2/2020. Dubai, United Arab Emirate.

Scientific Conferences

1. Alnami, Abdulmalik. (2020). Synthesized imine compounds possessing lethal antimicrobial activity. (Poster presentation). DUPHAT. 25-27/ 2/ 2020. Dubai, United Arab Emirates.

2. Altulahi.N, Alqahtani. A, (2020). Deprescribing Intervention of Potentially Inappropriate Medications Among Elderly Patients in The Primary Care Setting: A Prospective Controlled Study (Poster presentation). ACCP. 26-27/05/2020. USA.

3. Alhindi. Ghaida, Bin Essa. Maryam, Alshamrani. Majd, (2020). Knowledge, Attitude and Perception of Pharmacovigilance Among Health care Students in Saudi Arabia–A Pilot Study. (Poster presentation). SIPHA. 21-23/1/2020. Riyadh, Saudi Arabia

4. Alhindi. Ghaida, BinEssa. Maryam, Alshamrani. Majd (2020). Knowledge, Attitude and Perception of Pharmacovigilance Among Health Care Students in Saudi Arabia–A Pilot Study. (Poster presentation). DUPHAT. 25-27/2/2020. Dubai, United Arab Emirates.

5. Alsalim, L., Almohimeed, L., Alkofide, H., Aljedai, A., Alruwaili, A., Alissa, D., Almudaiheem, H. (2020). The Impact of a Restricted Pregabalin Prescription Policy on Drug Utilization: An Observational Study. (Poster presentation). ACCP. 25-31/5/2020.USA.

6. AlQahtani, Mohammed. (2020). Evaluation of medication therapy management clinic implementation on over all medication use in a tertiary hospital: A Prospective Study. (Poster presentation). DUPHAT. 25-27/2/2020. Dubai, United Arab Emirates.

7. Almebki, Renad. Alrumikan, Norah. (2020). Evaluating the effects of antibiotics sub-inhibitory doses on Pseudomonas aeruginosa quorum sensing dependent virulence and its phenotype. (Poster presentation). DUPHAT. 25-27/2/2020. Dubai, United Arab Emirates.

8. Althunayan SF, Alghamdi BM, Alnaim LS, Alghadeer SM, Bintaleb DA. (2020). Evaluation of Repeat Prescribing Process in Refill Clinics and Identifying Related Issues in KSUMC, An Observational Study. (PosterPresentation). DUPHAT. 25-27/2/2020. Dubai, United Arab Emirates.

Manuscript (submitted)

1. Almazrou, S.H., Alsubki, L.A., Alsaigh, N.A., Aldhubaib, W.H. (2020). Assessing the Quality of Clinical Practice Guidelines in the Middle East and North Africa (MENA) Region: Systematic Review. International Journal of Evidence-Based Health care. Submitted.

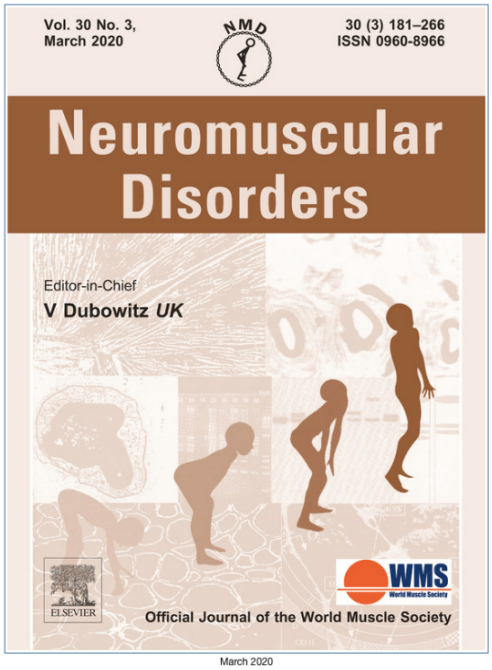
2. Aleanizy, F. S., Alrumikan, Norah. Almebki, Renad. 2020. Evaluating the effects of antibiotics sub-inhibitory doses on Pseudomonas aeruginosa quorum sensing dependent virulence and its phenotype. Frontiers in Microbiology, Antimicrobial, Resistance and Chemotherapy. Submitted.

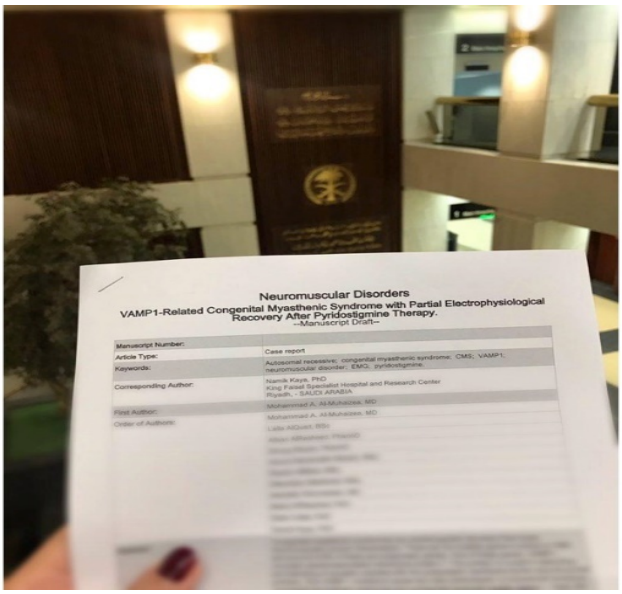
3. Almangour T, Alenazi B, et al. (2020). Inhaled colistin for the treatment of nosocomial pneumonia due to multidrug-resistant Gram-negative bacteria: A real-life experience in a tertiary care hospital in Saudi Arabia. Saudi Pharmaceutical Journal. Submitted.

4. Alwhaibi, M. Alhindi, G Alshamrani, M. Bin Essa, M. Alaloola, N. Alhawassi, T. (2020). Pharmacovigilance in health care education: students' knowledge, attitude and perception: A Cross-sectional study in Saudi Arabia. BMC Medical Education. Submitted.

Manuscript (accepted)

1. Mohammad A. Al-Muhaizea, Laila AlQuait, Afnan AlRasheed, Shoug AlHarbi, Anoud Abdulmalik Albader, Rawan AlMass, Albandary Albakheet, Abdullah Alhumaidan, Maha M. AlRasheed, Dilek Colak, Namik Kaya. (2020). ¬VAMP1-Related Congenital Myasthenic Syndrome with Unusual Partial Electrophysiological Recovery After Pyridostigmine Therapy. Neuromuscular Disorders. Accepted.





Pharmacy Practice and Pharmacotherapy

A Novel Mutation in SPTBN4 Leads to Cerebellar Ataxia in a Consanguineous Saudi Family

Student(s) Name: *Maissa Alfuraih, Aisha Alnafisah*
Supervisor(s) Name: *Maha M. AlRasheed*

Abstract:

Background

Autosomal recessive cerebellar ataxias (ARCA) are a heterogeneous group of rare neurological disorders affecting central and peripheral nervous systems. ARCA is characterized by uncoordinated movements, dysarthria, and dysmetria. To date, few causative genes have been linked to ARCA, including FRDA and SPTBN2. In this study, we aimed to identify the possible causative mutation associated with an ARCA in Saudi consanguineous family.

Methods

A consanguineous Saudi family with two ARCA affected individuals and healthy parents were recruited from Pediatric-neurology clinic at KFSH&RC. Comprehensive genetic analysis was performed on the individual's DNA using targeted gene panel screening, whole-exome-sequencing, and confirmatory Sanger sequencing. In addition, RT-PCR coupled with western blot were carried out to examine the functional consequence of the discovered variant.

Results

Initial genetic screening using a gene panel that targets known mutations for ARCA failed to detect any disease-causing candidate. Whole-exome-sequencing experiment was done and revealed c.1665+2T>C as the most plausible deleterious novel variant in SPTBN4. Sanger sequencing confirmed the segregation of the variant in the family. RT-PCR confirmed the skipping for a 46bp of exon12. The western blotting experiments indicated significant up-regulation of the protein in the blood.

Conclusions

This study reports a novel splice site variant leading to an aberrant transcript of the gene. Our findings extend the mutational spectrum of the SPTBN4 with a new phenotype that has not been reported previously. This work will create opportunities for genetic testing of ARCA, family counseling and gene therapy.

Assessing the Application of Essential Medication Errors Prevention Strategies in Healthcare Institute: STOP ME Project

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Supervisor(s) Name: *Tariq M. Alhawassi, Monira Alwhaibi, Noha Alaloola, Nawaf Abanmi, Ergie Inocian, Saud Alrumaih, Sondus Issam, Salma Alkhani*

Abstract:

Background

The STOP ME project is a comprehensive series of research studies that aims to explore MEs in Saudi Arabia. This study is the first of the STOP ME projects which aims to develop a tool that can assess the application of the essential strategies to minimize or prevent MEs in healthcare institutes in Saudi Arabia.

Methods

Extensive search of the literature review for essential strategies to prevent or minimize MEs was carried by the research team to develop a draft of the aimed tool. The survey tool was sent in round 1 to the Delphi experts panel for review. Based on received recommendations, the tool was updated and sent for round 2 review and consensus. The developed tool was then piloted to test the practicability of the tool before running the survey on a large sample size.

Results

After using Delphi technique two major changes happened in the survey. 1) A section was removed (high alert medications). 2) A new section added (ISMP publications) with some minor changes. Launching a pilot survey on thirty healthcare practitioners resulted in minor changes by adding two new columns (sometimes, not applicable). The final tool was a survey consists of six sections with 86 questions and the determined time to answer the survey is in the range of 25-30 minutes. Overall feedback of the pilot survey was good.

Conclusions

The study will build awareness among institutes in Saudi Arabia that are lacking important strategies that prevent MEs.

Clinical pharmacokinetic and pharmacodynamics of Rivaroxaban

Student(s) Name: *Razan S. Almofada, Asma'a M. Bin Hazzaa*
Supervisor(s) Name: *Saeed A. Alqahtani*

Abstract:
Background
Pharmacokinetics of rivaroxaban have been studies in different special populations and there were some differences in the pharmacokinetic parameters. However, most of these studies conducted in healthy subjects and on different ethnic groups. Thus, this study aimed to investigate the pharmacokinetic of rivaroxaban in real-world patients and to find out the variables that may cause variability in the pharmacokinetics and pharmacodynamic of rivaroxaban.
Methods
This was a prospective observational study. Five Blood samples were collected from each patient at different time after starting the rivaroxaban dose. Plasma concentration were analyzed using a validated high-performance liquid chromatography(HPLC) method. Then, population pharmacokinetic models were developed using Monolix (version 4.4) software.
Results
A total of 64 blood samples from 14 patients(50% male /50% female) were analyzed. Patients' mean(± SD) age was 50.5(±16.2) years and body weight was 83(±31.8) kg. The pharmacokinetics of Rivaroxaban was described by a one-compartment model. Covariates were tested for their influence on rivaroxaban pharmacokinetics. The initial estimates for absorption rate constant(Ka), apparent clearance(CL/F), and apparent volume of distribution(Vd/F) were 1.8 hr-1, 2.04 L/h, and 21.6 L, respectively. The inter-patient variability for Ka, CL/F, and Vd/F were 14, 24, and 21.6, respectively. Creatinine clearance(CrCL), body weight, and albumin has effect on CL/F, whereas the Vd/F was influenced by albumin.
Conclusions
In the initial analyses, the population pharmacokinetic model of Rivaroxaban found significant inter-individual variability between subjects. The results may lead to integrated PK-PD model that can aid the clinician during the initiation and adjustment of therapeutic regimens.

Evaluation of medication therapy management clinic implementation on overall medication use in a tertiary hospital: A Prospective Study

Student(s) Name: *Mohammed N. AlQahtani, Ali A. Bin Nouh*
Supervisor(s) Name: *Abdulaziz M. Alhossan*

Abstract:
Background
Medication therapy management (MTM) is a group of services that optimize therapeutic outcomes for patients. Patients with chronic diseases are usually taking multiple medications for different diseases, therefore, the risk of drug -drug interactions, medication adherence, duplication are very likely to happen. Implementation of MTM clinic can provide both patients and institution great benefit in terms of safety, efficacy and cost.
The Objective is to assess the impact of establishing a pharmacy-led medication therapy management clinic.
Methods
A prospective study started with establishment of a pharmacy-led MTM clinic and included all patients visited the MTM clinic between Sep 2019 and Feb2020.
A validated MTM reconciliation tool was used by a clinical pharmacist to interview all participants to assess all types of medication errors. The study included all patients aged ≥ 18 who take 5 medications or more. Patients aged < 18 or have less than 5 medications were excluded.
Results
Forty-two patients included and interviewed in the study. Out of 42 patients, 83% found to have DRPs (n=35).
Approximately 41 interventions were performed. The recorded interventions included:
Medication Errors (n=20, 39%), ADRs (n=9, 19%), duplication therapy (n=9 19%), and inadequate treatment plan (n=11, 23%).
25.7% of the patients didn't know their medications and 28% of them found to have adherence issues.
Conclusions
Pharmacy-led MTM clinic shows significant impact on identifying and correcting polypharmacy issues. Also, it shows great impact on educating patients, preventing major drug related problems and assessing level of medication adherence.

VAMP1-Related Congenital Myasthenic Syndrome with Unusual Partial Electrophysiological Recovery After Pyridostigmine Therapy: A Case Report

Student(s) Name: *Afnan A. AlRasheed, Shoug H. AlHarbi*
Supervisor(s) Name: *Maha M. AlRasheed, Namik Kaya*

Abstract:
Background
Congenital myasthenic syndromes (CMS) are several genetic disorders that impair neuromuscular junction transmission. About 30 mutated genes involved in CMS where, VAMP1, encodes the vesicle-associated membrane protein, is crucial in deducing and blending synaptic vesicles with the presynaptic membrane at the neuromuscular junction. Here, we are reporting a Saudi CMS case displayed absence of incremental response to rapid stimulation presented with a partial electrophysiological recovery after pyridostigmine therapy.
Case presentations
A girl from consanguineous Saudi family presented at 6 months of age with hypotonia and feeding difficulty requiring nasogastric tube feeding. She was noted to be floppy with reduced movements, food aversion and dysphagia. She suffered from recurrent chest infections with presumed aspiration pneumonia. The patient was started on pyridostigmine treatment which improved her motor skills by 30%. She continued to gain motor and language skills and was able to feed orally.
A comprehensive genetic testing revealed a homozygous splicing mutation (c.129+1G>A; p. G129+1A) in VAMP1. RT-PCR confirmed the presence of an aberrant transcript causing skipping of exon 2 in the gene. Our patient lacks incremental response which is atypical for presynaptic CMS. Although, there's partial electrophysiological recovery after pyridostigmine therapy.
Conclusions
This study presents CMS case clinical features, and genetic evidence demonstrating that c.129+1G>A produces aberrant splicing leading to CMS. The absence of incremental response to rapid repetitive stimulation is atypical for presynaptic CMS. This finding may be unique in VAMP1 related CMS and further studies are suggested. Our results may contribute to improvement in clinical care and development of gene therapy.

Assessment of Immune Related Adverse Events in Saudi Oncology Patients Receiving Immune Check-point Inhibitors.

Student(s) Name: *Nouf I. Almadallah, Lolwa M. Alsharekh*
Supervisor(s) Name: *Nora A. Alkhudair, Lamya S. Alnaim*

Abstract:
Background
Immune checkpoint inhibitors (ICPis) are monoclonal antibodies that are indicated for multiple cancers types. They function by blocking the binding of immune checkpoint molecules to their ligands; programmed death 1 (PD-1) and cytotoxic T lymphocyte antigen 4 (CTLA-4), reversing the inactivation of T cells and enhancing the immune response of T cells. This result in serious immune-related adverse events (irAE) that could lead to death if left untreated or not properly managed.
Methods
A multi-center retrospective cohort study conducted at King Khalid University Hospital (KKUH) and King Fahad Medical City (KFMC) from 2017 to date. The study was approved by IRB and participants were identified by electronic health care system. Oncology patients >18 years who received ICPis were included. Patient diagnosed with autoimmune diseases and/or taking corticosteroids were excluded.
Results
A total of 56 patients met the inclusion criteria, the median number of cycles was 6.
The percentage of adverse events experienced by the patients was 32.14%. Hypothyroidism adverse events occurred in 33% of patients, dermatological adverse events were seen with 33% of patients, 11% of patients developed hepatitis, 20% of patients were diagnosed with cardiotoxicity, pneumonitis, nephritis and colitis. None of the patients experienced grade 4 toxicity except for colitis. 22.2% of patients discontinued immunotherapy permanently due to the adverse events and 16.6% of patients held immunotherapy temporarily until the recovery of symptoms.
Conclusions
The rates of irAEs are lower than what is reported in initial studies, this might be due to lack of unified assessment tools and reporting system. However,

the incidences of treatment discontinuation and mismanagement is higher. Thus, developing an institutional based guideline will enhance the reporting rates and proper management of these AEs.

Prevalence of Intravenous Biologics Adverse Drug Reactions in Saudi Rheumatoid Arthritis patients: A Retrospective Cohort Study

Student(s) Name: *Hawazin S. Alhazzani, Reem S. Tashkandi, Lamia A. Alzamel*
Supervisor(s) Name: *Haya Almalaq, Shiekha Alaujan*

Abstract:

Background

Biologics have been advocated by guidelines as effective therapies for Rheumatoid Arthritis (RA), However; several adverse drug reactions (ADRs) were reported in short-term trials. Data comparing the long-term safety of all Intravenous (IV) biologics are lacking. Therefore, the objectives of this study were to determine the prevalence of ADRs associated with the long-term use of IV biologics, the time to develop ADRs, and possible risk factors for developing such reactions among Saudi RA patients.

Methods

An observational retrospective cohort was undertaken. Adults (≥18 years old) with a confirmed diagnosis of RA receiving IV Rituximab, Infliximab, Tocilizumab or Abatacept from January 2015-January 2020 were included from a tertiary hospital in Riyadh. Demographics, biologics data, ADR with a causality assessment using Naranjo scale, and laboratory data were collected. SPSS was used for Chi-square test, ANOVA, multivariate logistic and survival analysis.

Results

Out of more than 3000 reviewed patient visits, 308 ADRs were detected in 122 patients (mean age ± SD; 54 ±12.63, Females; 88.5%). Prevalence of ADRs was 81.97% among study population. (Abatacept; 21%, Rituximab; 31%, Infliximab; 12%, Tocilizumab; 36%). The adjusted odds ratio (95% Cl) for experiencing an ADR (Naranjo Scale >3) was 1.3 for Abatacept (0.34-4.96), 0.49 for Rituximab (0.19-1.24), 2.4 for Infliximab (0.29-20.18) and 1.42 for Tocilizumab (0.54-3.71). The median for time-to-first ADR was 188 days (IQR;162-258).

Conclusions

ADRs are prevalent among Saudi RA patients receiving long-term IV biologics with six months period to appear post administration. The highest adjusted odds ratio for ADRs was observed with Infliximab.

Assessment of the impact of mobile application implementation in a diabetes clinic on management outcomes

Student(s) Name: *Roaa F.Alharbi, Sarah A. Alrowis , Amjad Khalid*
Supervisor(s) Name: *Abdulaziz M. Alhossan*

Abstract:

Background

The prevalence of Diabetes Mellitus (DM) in Saudi Arabia was increased to 17.4% in 2015 which is higher than the global level. Mobile health technologies are rapidly expanding with 70%–90% of the world's population are using these technologies. Our research was intended to implement a mobile app for diabetic patients to determine the impact of these apps on clinical outcomes on diabetic patients.

Methods

This is a pilot randomized controlled study, involved all patients who visited DM clinics at King Khalid University Hospital and met inclusion criteria. Patients were divided to either intervention or control group. The intervention group was provided with a mobile app designed by the research team. The app records patients' blood glucose readings, provide reminders, and educational materials. All patients had at least 2 HgbA1c readings over 6 months. The primary outcome was the change in HgbA1c readings. The secondary outcome was to assess the participants' satisfaction levels by completing a short survey.

Results

Forty patients were included and divided equally. The mean HgbA1c was 8.9±0.4 for both groups. HgbA1c levels were reduced better in the intervention group (-0.44 versus -0.19), however the difference was not statistically significant (p=0.08 and 0.2 respectively). The survey revealed that 80 % of patients were satisfied with the app and 93% of patients considered the app as a helpful tool.

Conclusions

Our pilot study showed a promising benefit of using mobile apps in helping controlling diabetes by providing better monitoring and educational materials.

Interrupted Versus Uninterrupted Anticoagulation Therapy for Catheter Ablation in Adults with Arrhythmias: A Cochrane systematic review and meta-analysis

Student(s) Name: *Aya Ahmed Alsharafi, Nada Omar Babakr, Arwa M. Altorkistani*
Supervisor(s) Name: *Ghada A. Bawazeer, Hadeel A. Alkofide*

Abstract:
Background
Management of anticoagulation therapy around time of major procedures is critical. Current guidelines provide diverged recommendations. Hence, the aim of this study is to systematically compare the efficacy and harms of interrupted anticoagulation (IA) versus uninterrupted anticoagulation (UA) therapy for catheter ablation (CA) in adults with arrhythmias.
Methods
Randomized clinical trials comparing IA versus UA therapy for CA in adults ≥18 years with arrhythmia were identified, with no language restriction, using several databases (e.g. MEDLINE, Embase, Cochrane, and CENTRAL) from inception to January 2020. The primary outcomes were thromboembolic event (TEE) and major bleeding. Secondary outcome was minor bleeding. Screening and data extraction were performed independently. Cochrane Risk of Bias 2.0 tool was used to assess study quality. The results were combined using random-effect model meta-analysis. The protocol was published in Cochrane Library (ID:10.1002/14651858.CD013504)
Results
The analysis of 4,538 pooled patients from 9 trials showed a non-significant increase in TEE in IA compared to UA group (RR 1.98, 95% CI 0.54–7.26, I2= 59%), with I2 reflecting moderate heterogeneity. No significant difference between the groups in major (RR 1.13, 95% CI 0.55–2.34, I2= 20%) or minor bleeding (RR 1.70, 95% CI 0.63–4.60, I2= 88%). All included studies were assessed as having high risk of bias across at least one domain, which was mostly being non-blinded.
Conclusions
This review shows no difference between interrupting or uninterrupting anticoagulation therapy for people with arrhythmia going through CA procedures. Future high-quality and adequately powered trials are warranted to draw firm conclusions.

Inhaled colistin for the treatment of nosocomial pneumonia due to multidrug-resistant Gram-negative bacteria: A real-life experience in a tertiary care hospital in Saudi Arabia

Student(s) Name: *Basel F Alenazi*
Supervisor(s) Name: *Thamer A Almangour*

Abstract:
Background
Nosocomial pneumonia (NP) due to multidrug-resistant (MDR) Gram-negative pathogens, has continued to rise over the last several decades. Parenteral administration of colistin results in poor alveolar penetration and subtherapeutic concentration; therefore, direct drug deposition at site of infection may improve the effectiveness while minimizing the systemic exposure. The aim of this study is to describe the safety and effectiveness of inhaled colistin for the treatment of NP caused by MDR Gram-negative pathogens.
Methods
Patients who received inhaled colistin from May 2015 to May 2019 at 2 different tertiary care hospitals in Riyadh, Saudi Arabia were identified from pharmacy databases and their charts were retrospectively reviewed.
Results
Eighty-six patients were enrolled in this study. The mean age was 56 ± 20 years. The mean Acute Physiology and Chronic Health Evaluation (APACHE II) was 17 ± 5. The responsible pathogens for NP were Pseudomonas aeruginosa (60%) Acinetobacter baumannii (28%), and Klebsiella pneumoniae (9%). Most patients (76/86) received concomitant intravenous antibiotics. Mean colistin total daily dose was 6 ± 3 MIU divided into 2-3 doses. Mean inhaled colistin duration of therapy was 11 ± 6 days. Favorable clinical outcome was achieved in 51 (59%) patients while favorable microbiological outcome occurred in 29 (34%) patients. Death due to all causes was noted in 39 (45%) cases. Renal injury occurred in 19 (22%) patients, all received concomitant intravenous colistin.
Conclusions
Inhaled colistin can be considered as salvage therapy as adjunct to intravenous administration for treatment of patients with NP due to MDR Gram-negative pathogens.

Utilization Patterns of Multiple Sclerosis Medications in Saudi Arabia: A Cross-Sectional Retrospective Study

Student(s) Name: *Almaha H. Alfakhri, Zakiyah M. Alkherb.*
Supervisor(s) Name: *Tariq M. Alhawassi*

Abstract:
Background
Multiple sclerosis (MS) is a chronic disease of the central nervous system. Although there is no cure for MS, several disease-modifying drugs (DMDs) are available. Data on the utilization patterns of DMDs in MS patients are limited. Therefore, the aim of this study was to describe treatment patterns among patients with MS in Saudi Arabia.
Methods
A retrospective, cross-sectional medical records audit was conducted in a large tertiary university hospital in Riyadh, Saudi Arabia. Patients with documented MS diagnosis who received at least one of the DMDs during the period from 2016 to 2018 were included. Categorical and continuous variables were summarized.
Results
A total of 420 MS patients were included, of whom 297 (70.7%) were females and the mean age was 34.41±9.42 years. 188 (44.8 %) patients had at least one comorbid condition, with endocrine, nutritional, and metabolic diseases being the most common (13%), followed by mental and behavioral disorders (10%). Interferon (77.9%) was the most commonly initially prescribed medication, followed by Fingolimod and Natalizumab (11.9%, 6.9%) respectively. Only 40.5% of the patients required treatment alteration and the most common reasons were adverse drug reactions (34.7%) and compliance issues (18.8%). Interferon initiators were more likely to remain on their initial medication [3.34 (1.93-5.79); p<0.0001], less exposed to treatment relapses, and had no treatment gaps nor comorbid conditions (76.1, 71.8,80.4%).
Conclusions
Majority of patients started on interferon and were more likely to remain on their initial treatment. Likewise, during the study period, interferon was the most commonly used medication despite the launch of newer DMDs.

Effect of nicotine on molecular signaling in autistic mice model

Student(s) Name: *Yaser B. Zaghloul, Mohammed F. Alqahtani*
Supervisor(s) Name: *Shakir Alsharari*

Abstract:
Background
Autism spectrum disorder is a disease linked to brain development and how it effects the patient's behavior and how they socialize with others. The nAChRs has been associated with several neurodevelopmental disorders including ASD. As it has been shown in autistic patients a reduction of α4β2 nAChRs gene expression in the cortex as-well-as post-transcriptional abnormalities of the α7 and α4β2 nAChR subtypes binding in the cerebellum. Therefore, the aim in this study is to identify the effect of nicotine on molecular signaling in the BTBR mouse model of autism.
Methods
The effect of nicotine was identified by the treatment of nicotine in drinking water 100 mcg/ml in BTBR mice male while C57 used as control group, after 14days. The mice were sacrificed to collect the blood and brain tissue for further examinations, by performing western blot, RT-PCR, Flow cytometry and Bioplex-200. the data was analyzed by one-way ANOVA and tuekey's multiple comparisons test.
Results
It has been shown in this study that nicotine reduced the expression of intracellular proinflammatory cytokine (IL-17 & IFN-γ) ON cd+ and CD8+ T cells in blood while TNF-α, IFN-γ, IL-1β and GM-CSF was decreased by nicotine in the serum. In addition, it was reported that nicotine up-regulated the protein expression of α7, α4 and β2 nAChRs and down-regulated the expression of p-p38 MAPK in BTBR mice.
Conclusions
This research revealed the impact of nicotine on molecular signaling in BTBR mouse model, as it could be a significant therapeutic objective for such situation

Estimation of Phynytoin Pharmacokinetic Parameters in Saudi Epileptic Patients

Student(s) Name: *Mashal F. Alotaibi*
Supervisor(s) Name: *Saeed A.Alqahtani*

Abstract:
Background
Objective: study aimed to assess the population pharmacokinetics of phenytoin in Saudi patients and identify factors affecting therapeutic parameters.
Methods
A retrospective chart review was performed at King Saud University Medical City on patients treated with oral phenytoin. We used Monolix 4.4. for population pharmacokinetic modeling. A base model was developed to investigate several covariates, including age, gender, weight, total daily dose (TTD), and liver function test results.

Results
The analysis included a total of 81 phenytoin plasma concentrations from 43 patients (70% male). Patients' mean (± SD) age was 41 (±18.7) years and body weight was 65.4 (±17.7) kg. The patients received a phenytoin TDD of 330.5 (±104.5) mg/day, resulting in a trough concentration of 11.2 (±10.3) mg/L. The data were sufficiently described by the one-compartment open model with linear absorption and nonlinear elimination processes. Average parameter estimates for phenytoin volume of distribution (V), maximal elimination rate (Vmax), and Michaelis-Menten constant (Km) were 0.61 L/h/kg, 6.12 mg/kg/day, and 5.33 mg/L, respectively. The most significant covariates on phenytoin Vmax and Km were the age and body weight of the patients, along with valproic acid (VPA) cotherapy.
Conclusions
The population pharmacokinetic model of phenytoin in Saudi patients found significant interindividual variability between subjects, which was affected by the patients' age, body weight, and VPA cotherapy as the most significant covariates on phenytoin Vmax and Km. To provide guidance in drug dosage decisions, further studies are required to evaluate all factors that may potentially influence the pharmacokinetics of phenytoin.

Are clinical pharmacists ready to use pharmacogenetics to select patients for pharmaceutical care in Saudi Arabia?

Student(s) Name: *Hessa G. Aldajani.*
Supervisor(s) Name: *Norah O. Abanmy*
Abstract:
Background
Clinical pharmacists are the experts in selecting the appropriate drug of choice for every patient. This study aims to explore the clinical pharmacist knowledge of pharmacogenetics, their readiness to implement it and the barriers hindering such implementation.
Methods
A pre-validated questionnaire was used in this cross-sectional survey. The survey consisted of six sections. Section one covers demographic characteristics. The second explore the pharmacogenetic training. Section three and four assess participant's knowledge and pharmacist perception regarding the application of pharmacogenetics, respectively. Section five investigates the pharmacists' confidence in applying pharmacogenetics. The last section lists different learning methods for future pharmacogenetic and barriers that prevent pharmacogenetic application in practice. Descriptive analysis was used.
Results
A total of 38 clinical pharmacist were participated in this survey, 31.6% of them were above age 36, 31.6% of them have an experience of more than 10 years and 44.7% of them were female. Pharmacogenetics training have been completed by 2.6% of them. Only 23.7% had applied Pharmacogenetic testing and 18.4% of them counseled patients on the results of pharmacogenetics testing. The overall participants mean SD total knowledge score percentage was 61.6%, while 69.3% of participants expressed positive perception towards Pharmacogenetics. Only 28.3% of participants indicated that they felt confident in applying Pharmacogenetics. Lack of training and of testing devices were reported to be the top two barriers facing the implementation of pharmacogenetics in Saudi Arabia.
Conclusions
The results indicated the need for actions to improve training, and create appropriate environment to provide pharmacogenetics services.

Assessment of knowledge among caregivers of diabetic patients in insulin dosage regimen and administration

Student(s) Name: *Noura Alquraishi, Sara Aldihan, Rahaf Altuwaym*
Supervisor(s) Name: *Lamya Alnaim*

Abstract:
Background
Over the past decade, the incidence rates of diabetes has increased exponentially. As a result, treatment regimens became more complex and the need of caregivers has risen. Therefore, this study aims to assess caregivers' knowledge about insulin doses administration and adjustment, and its correlation with the demographic data.
Methods
This cross-sectional descriptive study involved 816 caregivers assessed through a self-administered questionnaire, it consists of three parts: caregivers' demographic data and general knowledge about insulin administration and dose adjustment.
Results
The results showed that caregivers who are 50 years of age and older had better knowledge than the younger age groups. Furthermore, there was a significant association between the level of education and the knowledge (P=.030). Moreover,

the association between the knowledge and time of initiating insulin therapy was highly significant(P=.011). Additionally, a very significant result linked the knowledge of caregivers to the recent diagnosis of care-recipients (P=.000). Regarding insulin knowledge, 80% of caregivers agreed on the importance of using alcohol wipes before injecting insulin, while several caregivers have no knowledge regarding either changing the insulin injection location (over 50%) nor massaging the injected area (35%). However, the majority agreed on giving the care-recipient a source of sugar when they experience hypoglycemia.

Conclusions

To provide all the needed support to care-recipients and to ensure adherence to medications, caregivers must be empowered by education and should be assessed periodically; in order to improve the overall diabetes management.

Drug utilization pattern among patients with autism spectrum disorders in Saudi Arabia

Student(s) Name: *Norah L. Alsunaidi, Sarah I. Batah*
Supervisor(s) Name: *Jawza F. Alsabhan*

Abstract:

Background

Autism spectrum disorder (ASD) is a Neuro-developmental disorder characterized by impaired social skills, communication problems, and repetitive behaviors. According to clinical practice the most frequently used drugs are antipsychotics. However, previous drug utilization studies showed an unclear dynamic pattern of ASD treatment. We aimed to describe the treatment pattern in patients with ASD and explore how antipsychotics use is affected of age, gender and comorbidities.

Methods

A retrospective cross-sectional study was conducted at King Saud University Medical City By using an electronic health record database. All diagnosed patients with ASD of all ages and both genders receiving antipsychotics between 2015 and 2019 were included. The study prescribing pattern was analyzed according to World Health Organization guidelines.

Results

The sample size is 87 patients, their mean age were 12.2±7.2 years old, with male-to-female ratio approximately 3:1. The result revealed that patients with ASD were having at least one comorbid condition (31%), including ADHD (41.4%) and epilepsy (19.5%). More than half of patients (73.6%) were following medication therapy, includes risperidone (76.6%) and methylphenidate (9.4%). Most patients continue receiving risperidone (30%), while the rest discontinued (<30%) due to non-improvement (15.6%). The result is compatible with guidelines and previous DUE studies for ASD medications.

Conclusions

Drug used to treat ASD are generally in accordance with guidelines. Comorbidities were treated rather than the ASD itself. Our study highlights the need for larger scale studies assessing the implications of antipsychotic-related problems with ASD in Saudi Arabia that can facilitate the application of clinical practice guidelines.

Rheumatoid Arthritis Patients Skills, Confidence, and Knowledge in Managing Their Own Disease Results of Patient Activation Survey in Saudi Arabia

Student(s) Name: *Jawaher H. Almutairi, Najd A. Alswyan and Dalal A.Alsanea*
Supervisor(s) Name: *Lobna A.Aljuffali , Haya M. Almalaq, Mohammed A. Omair*

Abstract:

Background

Patients skills, confidence, and knowledge in managing their disease is the definition of patient activation (PA), which is considered a measurement of patient engagements. patients with high activation levels tend to take a pro-active role as evidence suggest. Assessing patient activation levels can help therapeutic success in context of chronic illness.

Methods

A cross-sectional survey was done. All participants attending rheumatology clinics at King Saud Medical City, Riyadh ,SA with confirmed RA diagnosis and agree to participate were included. After informed consent was signed and patient were interviewed to record PAM13, medical chart was reviewed to collect demographics, disease related information at time of visit. Data was coded and entered in to SPSS version 25 and appropriate statistics was done.

Results

A 100 patients agreed to participate. The mean age was 49 years SD 11.5 ,90% were female, only 34% had a college degree and 14 % were illiterate, the mean duration of illness was 14 years SD 8.Their mean PAM13 score was 80±14. Around 88% of the participants were at level 4, while 5% were in level 1. Patients in level 1 (low PA) had lower education level (age = 55.4 SD 15 , all female). There were no

association between disease activity and duration of illness and PA.

Conclusions

Patients showed higher PA scores than reported studies. All patients were treated in a specialized clinic with a clinical pharmacist that provided education and follow-up. Further data is needed to compare with patients not attending such clinics.

Evaluating the Use of Bone Modifying Agents in Multiple Myeloma Patients: A Cohort Retrospective Study

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Supervisor(s) Name: *Nora A. Alkhudair, Hadeel A. Alkofide.*

Abstract:

Background

Skeletal-related events is a common complication of multiple myeloma (MM). International guidelines recommend starting bone-modifying agents (BMAs) at time of diagnosis; however, no evidence exists on whether this practice is being followed in real world settings. Therefore, this study aimed to investigate the appropriateness of BMAs use in subjects with MM.

Methods

Ethical approval was obtained to conduct a retrospective observational study of subjects with MM in two tertiary centers from 2005-2019. The primary outcome was proper use of BMAs in concordance with international practice guidelines. Secondary outcome was following monitoring recommendations for kidney function and dental examination prior to BMA use. Descriptive analysis and logistic regression models were used to investigate possible predictors for proper BMA use.

Results

Seventy individuals with MM were included, with a mean age of 62 years, and 51% were male. Around 77% were prescribed a BMA, of which 61% received an agent within a month of diagnosis, while therapy was delayed for up to 19 months in the remaining participants. In 70% of those receiving a BMA the proper dose was used. Dental examination prior to BMAs initiation was performed in 48% of the subjects, and 50% had their serum creatinine checked before each BMA dose. The presence of bone metastasis at time of diagnosis was the only predictor for proper BMA use (odd ratio=8.2, CI=2.4-29.9).

Conclusions

This study shows suboptimal use of BMA in subjects with MM, interventions to improve the real-world use of these crucial agents need to be investigated.

Impact of pharmacist-led preventive medicine services on overall health outcomes: A combined retrospective - prospective study

Student(s) Name: *Ahlam S. Alharbi, Arwa G. Alamri ,Moudhi I. Alolayan*
Supervisor(s) Name: *Abdulaziz M.Alhussan, Mansour S. Almetwazi*

Abstract:

Background

Clinical Pharmacy Services are defined as professional services provided by clinical pharmacists, the role of clinical pharmacist in providing such a preventive medicine is less defined, the aim of this study was to examine the impact of clinical pharmacists in providing preventive medicine services to overall health outcomes.

Methods

Methodology combined retrospective-prospective chart review study was conducted on all patients who visited the pharmacy-led clinics to evaluate the impact of providing preventive medicine services by clinical pharmacists. The inclusion criteria included Saudi patients who were seen between July2018 and February 2020. The exclusion criteria included patients with no services provided.

Results

Ninety-two patients were included in this study. The mean age was 59±5 years, in which 70% of them were females. Eighty patients (87%) were screened for depression in which 4 of them were positive (5%). Seventeen percent of the included patients had mammogram screenings and 6 of them found to have positive results (33.3%). Thirty-three patients were screened for osteoporosis (35.9%) and 16 of them were positive for osteopenia, one of them was positive for osteoporosis, and one was undifferentiated. Eight-nine patients had a monofilaments exam (96.7%) in which 9 of them had positive results (10%). Two patients were screened for prostate specific antigen test one of them was positive (50%). Seventy-six patients were offered vaccinations (82.6%) and43 of them received them (56.5%).

Conclusions

The study has found that role of clinical pharmacists in providing preventive medicine services is valuable

and have great positive impact on overall health promotion.

Assessment of the outcomes of venous thromboembolism (VTE) prophylaxis among cancer patients in tertiary hospital

Student(s) Name: *Njoud F. aloraini, Reem H. Alshathri*
Supervisor(s) Name: *Ghada Bawazeer, Noura Alkhudair, Lamya Alnaim*

Abstract:
Background
Cancer patients are at high risk of developing venous thromboembolism (VTE) which can lead to significant morbidity and mortality. Thrombus-prophylaxis (VTE-P) measures are a crucial standard of care in such a population. This study aims to evaluate the effectiveness and harms of the prescribed VTE-P and to describe the trends of VTE-P in cancer patients at King Saud University Medical City (KSUMC).
Methods
A retrospective analysis of all cancer patients of all ages, both genders, admitted to KSUMC. Data related to participants demographics, cancer treatments, labs and VTE-P regimen were extracted from eSihi from May 2015 to date. The study is approved by KSUMC-IRB (No. E-19-3864).
Results
Preliminary analysis was performed on 101 patients' records. The population mean age was 57+15 years, 57% females, 35% with normal platelets, 10% had previous VTE, and 14% had a bleeding history. A total of 188 VTE-P doses were given during the study period using either unfractionated heparin (UFH) (40%) or enoxaparin (60%). All UFH doses were appropriate, while 33% of enoxaparin doses were inappropriate. VTE occurred more frequently in the enoxaparin group (n=5) compared to UFH (n=1). Overall, VTE-P duration was < 1-month (46%), 1-3 months (25.4%) and > 3months (28.6%). Bleeding occurred in 13 cases, thrombocytopenia in 4 cases and death in 19 cases.
Conclusions
Hospital-wide thromboprophylaxis guidance for enoxaparin dosing is needed to ensure safe and effective VTE-P in cancer patients.

Evaluation of Repeat Prescribing Process in Refill Clinics and Identifying Related Issues in KSUMC, An Observational Study

Student(s) Name: *Shatha F. Althunayan, Bushra M. Alghamdi*
Supervisor(s) Name: *Lamya S. Alnaim, Sultan M. Alghadeer*

Abstract:
Background
Repeat prescribing is a service that provides medications for chronic illnesses for a long term to cover patients' needs before their next follow up visit. The process of repeat prescribing with extensive review of patient profile and critical investigation of new issues is essential to protect patients from possible medication errors; however, this matter has not been assessed appropriately worldwide, especially in Saudi Arabia. The aim of our study is to identify repeat prescribing related issues and assess the action done by pharmacists to resolve them.
Methods
An observational, prospective cross-sectional study was conducted for all repeat prescriptions processed by refill clinics in a tertiary hospital in Riyadh from September 2019 to January 2020. Data was obtained by reviewing electronic health records and report documentation from outpatient pharmacy while dispensing repeat prescriptions.
Results
1767 repeat prescription related issues were detected. The most common issue encountered was "patients come too early to collect" which accounted for 990 (56%) of total issues, followed by "Refilling a restricted medication" reported at 247 (14%). Further issues were identified such as medication duplication, refilling a stopped medication and changing the dose while refilling.
While observing the pharmacist's role in identifying and taking action on each issue category, only 11.1% of issues were acted upon by pharmacists.
Conclusions
The pharmacist's role in identifying and taking action with repeat prescription related issues was not optimal. Future implementation of new refill clinic models should be encouraged to ensure the effective role of pharmacist in preventing such issues.

Assessment of Rivaroxaban Use for Cancer-associated Venous Thromboembolism Management

Student(s) Name: *Lujain I. Allehyani, Haifa H. Alosaimi*
Supervisor(s) Name: *Ahmed F. Aldemerdash*

Abstract:
Background

The mainstay of cancer-associated thromboembolism (CAT) management is low-molecular weight heparins. Current availability of oral anticoagulants with close mechanism of action made them attractive alternatives; however, strong evidence lacks. This study aims to assess the rate of recurrent venous thromboembolism (VTE) and bleeding over 12 months in patients receiving rivaroxaban for CAT.

Methods

A retrospective IRB approved chart review (6/2015 to 3/2018) at KSUMC. Variables included demographics, indications, comorbidities, cancer type and management, VTE and/or bleeding. Inclusion criteria were age ≥18 years, current diagnosis or history of cancer and rivaroxaban prescription for CAT. The primary outcome is recurrent VTE or major bleeding (ESSENCE definition) over 12 months. Data presented as number (percent) or mean ± standard deviation or median [Interquartile Range].

Results

The average patient, of 91 included patients, was 63-year-old female with 81 mL/min CrCl and on rivaroxaban 20mg. The most common cancer types were breast cancer (29%), lymphoma (9%), and colon cancer (7%). Cancer was stable in 59% and metastatic in 26%. Majority of patients were receiving cancer therapy (84%) of which 66% were on chemotherapy and 49% had surgery. Ottawa score was low in 57% and median bleeding risk factors was 2. Previous VTE was documented in 63% of patients. Primary outcome occurred in 11% of which 60% had VTE and 40% major bleeding.

Conclusions

The results of this study match the published evidence on rivaroxaban safety and efficacy for CAT. However, larger studies are needed to better assess such low event rate in our population.

Deprescribing Intervention of Potentially Inappropriate Medications Among Elderly Patients in The Primary Care Setting: A Prospective Controlled Study

Student(s) Name: *Alhanouf S. Alqahtani , Noura B. Altulahi*
Supervisor(s) Name: *Ghadah A. Bawazeer*

Abstract:

Background

Using potentially inappropriate medications (PIM) is associated with increased risks of adverse events in the elderly population. PIM occurs when the harm of a medication outweighs its benefit. Deprescribing (DeRx) is a supervised process to eliminate PIM in order to improve patient outcomes. Beers criteria and STOPP are common tools used during medication-review in elderly (age≥65 years). The goal of this research is to assess the feasibility and efficacy of DeRx in primary care clinics in KSUMC.

Methods

The study is a prospective controlled investigation on elderly patients aged≥60 years, of both genders and receiving at least one of the targeted PIMs. The intervention group received care by clinical pharmacists or geriatricians, where Beers criteria and STOPP tools were used for PIM assessment. The primary outcome is successful deprescribing. The study is IRB (E-19-3951) approved.

Results

A total of 30 elderly with mean(SD) age of 69±6.70 years, 70% female, mean(SD) medications per patient 8.73+2.9 and mean(SD) PIM 1.50±0.57 were identified. Collectively, 44 PIMs were targeted for DeRx. Eighty-six percent were successfully deprescribed: aspirin (34.21%), pantoprazole (31.58%), NSAID (15.79%), antihyperglycemic (13.16%) and antidepressant (2.62%). DeRx method was performed by either stopping (63.64%), tapering or use as needed (22.73%) and/or recommending alternative drug (13.64%). Refusal of DeRx was low.

Conclusions

Deprescribing of PIM is feasible and acceptable by patients, and it can improve patient safety and outcomes. The study is still ongoing to assess the impact of DeRx on polypharmacy and hospitalization at 12 months compared to the control group.

Social Pharmacy and Pharmaceutical Outcomes

Assessing the quality of clinical practice guidelines in the Middle East and North Africa (MENA) region: systematic review

Student(s) Name: *Layan A. Alsubki, Norah A.Alsaigh, Wazha H. Aldhubaib.*
Supervisor(s) Name: *Saja H. Almazrou*

Abstract:

Background

Recently, clinical practice guidelines (CPGs) progressively become a popular tool to make optimal clinical decisions. The literature showed poor quality of CPGs can form a barrier to adhere to them resulting in suboptimal level of health care. The objective of this systematic review is to evaluate

the quality of CPGs in the Middle East and North Africa (MENA) region using the Appraisal of Guidelines for Research and Evaluation II (AGREE II) instrument.

Methods

We searched in MEDLINE and Embase databases through the Ovid interface. Keywords related to CPGs and MENA countries were combined using Boolean search operators. The search was not limited to specific disease. The AGREE II instrument was used by four reviewers and the final number of included CPGs was divided into two sets each appraised by two reviewers independently. Discrepancies within a group were resolved by the involvement of a principle investigator.

Results

A total of 61 CPGs were appraised. They were mainly from Saudi Arabia and the most covered disease topic was cancer. Among the six domains of AGREE II instrument, CPGs scored the highest on clarity of presentation (mean 82%) while the lowest score was granted to rigour of development domain (mean 28%) which shows deficiencies in reporting the developmental process of CPGs and the resources used for the synthesis of evidence.

Conclusions

Our findings shall help policy makers identify areas of improvement in the guidelines which can lead them to implement strategies as training individuals and recruiting experts to ultimately develop high-quality guidelines.

Design an application for gluten and allergen free medication

Student(s) Name: *Maram AL harbi, Daad Almaziad*
Supervisor(s) Name: *Ebtihal ALAbdullah, Noura ALZoman, Haya ALJohar*

Abstract:

Background

Celiac disease (CD) is a chronic digestive disorder that the body cannot tolerate gluten, found in wheat, barley and rye. Gluten can be hidden in food, medications and supplements. CD is an autoimmune disease leads to damage in the small intestine. It is estimated to affect 1in 100 people worldwide.CD can be difficult to diagnose because it affects people differently, some people have no symptoms, but still test positive on CD blood test.

Methods

Systematic review analysis to determine if medication contain gluten or no based-on ingredients or excipients listed in leaflets of the drugs which have been approved by Saudi FDA. We have been
visited many community pharmacies to gather the information required for our research.

Results

The results were classified into five categories depending on their impact on CD patients. Gluten containing denoted by number 4, if the medication contains wheat, barley or rye. Contrariwise If starch listed as “corn” or potato, can be assumed to be gluten free and indicated by number 1. If starch by itself is listed, a call to the manufacturer to confirm the source of the starch and indicated by number 2. Celiac and gluten sensitive individuals don’t need to be concerned about sugar alcohols, so we indicate that by number 5. If contains maltodextrin which is derived from a wheat source although it has been deemed safe for persons with CD indicated by number 3.

Conclusions

Waiting for completion the designing of the application and launch it for celiac patients.

Assessment of knowledge, attitude, and prevalence of electronic cigarettes among health students

Student(s) Name: *Mohammed M. AL Nawwar , Saleh M. Alrubaish*
Supervisor(s) Name: *Mohamed N. Al-Arifi , Abdulrahman M. Alwhaibi*

Abstract:

Background

Despite the increased acceptance of e-cigarettes (ECs) worldwide, little is known about their safety.

Methods

This is a cross sectional study that was conducted on a sample of health colleges male students including medical college, pharmacy college, dentistry college, nursing college and applied medical sciences college, at King Saudi university. A convenience sampling procedure over a one-month period in February 2020 was performed to obtain data, which was collected by self-administered paper questionnaire in English.

Results

A total of 346 students returned the questionnaire. The majority of students were pharmacy and dentistry colleges (32.7 %) and second year students (34.4 %). More than half of students (52.9 %) never smoked, 20.2 % were ex-smokers and 26.9 % of students were currently smokers. Approximately, 62 % of respondents never used e-cigarette (ECs), while 22 % used ECs for recreational purpose and the rest of 16 % used for smoking quit purpose. About 42 % of students believed that ECs can help in reducing and quitting smoking, whereas 31.8% reported that the e-cigarette doesn't have any adverse effects compared to conventional tobacco cigarette. Around two-third of students (63.4 %) agreed that ECs can be used as an alternative method of quitting conventional cigarettes more than other smoking-cessation methods. About 43.0% of students reported that ECs contain carcinogens similar to those produced by conventional tobacco cigarettes.

Conclusions

The results of this study indicate that health colleges students had inadequate knowledge about ECs. So, additional studies are required to increase awareness about e-cigarettes.

Pharmacists' Knowledge About Drug Disposal in Saudi Arabia

Student(s) Name: *Abdullah Alhwaimil, Saad Alhwaimil*
Supervisor(s) Name: *Mohamed N. Al-Arifi*

Abstract:

Background

A huge amount of drug is utilized yearly for diagnosis, treatment or prevention of diseases. Minor amounts of drug waste can be enlarged because of lacks in drug management, delivery and lacking a routine system for drug disposal. Dangerous disposal of these unused or expired drugs could lead to a serious problem.. Undesirable medications involve unused, fallen and contaminated pharmaceutical products, medications and vaccines that are no longer never again required and should be disposed of appropriately.

Methods

This was a cross sectional survey was done between July and August 2019. A survey was established to investigate community pharmacists' knowledge, opinion, attitude about disposal of drugs in Riyadh city, Saudi Arabia.

Results

A whole of 367 questionnaires were completed and returned (response rate,100 %).

This survey found that the most common route of disposal of unwanted solid medications (i.e. tablets and capsules) were given to pharmaceutical distributor (75.2%), and putted in medicines' bin (16.1%). for semi-sold products (ointment and creams), the most of community pharmacists (73.8%) reported that they give unwanted productions to pharmaceutical distributor. In addition, for liquid dosage forms, 73 % of community pharmacists revealed that they return back the unwanted liquid productions to pharmaceutical distributor, while some of pharmacists (4.4%).

Conclusions

In conclusion, the majority of CP's rout of disposal of unwanted medications is sent it back to pharmaceutical distributor. The minority of CP were consider the routes of UM disposal that could affect the environment, need educational courses and workshops to improve their knowledge regarding medication disposal.

The economic burden of rheumatoid arthritis in Saudi Arabia: A single-center Cross sectional Study

Student(s) Name: *Khaled Alsaif, Mousab Alsahli*
Supervisor(s) Name: *Ahmed Alghamdi*

Abstract:

Background

Rheumatoid arthritis (RA) is a chronic and disabling disease associated with considerable global economic burden. The aim of this study was to estimate the economic burden of rheumatoid arthritis and its predictive factors in Saudi Arabia from healthcare provider perspective.

Methods

This was a retrospective prevalence-based single-center cost of illness study conducted at KSUMC. Patients' medical records were reviewed for the year 2019. A bottom to up micro-costing approach was conducted to estimate the direct medical costs including (medications, lab and diagnostics, hospitalization, procedures, visits, emergency, and physical therapy). Descriptive and inferential statistics were performed.

Results

A total of 400 RA patients included in the study with mean age of 54 years. Most patients (89%) were female and the mean disease duration was 9 year. The average annual cost per patient was SAR 38,596 ± 3055. The cost increased to SAR 75,097 in patient

who had knee replacements procedures. In addition, the cost was significantly increased by SAR 3,971 with each additional comorbidity (p=0.012). The major driver of RA cost was the cost of biologics followed by lab and diagnostic tests, and outpatient visits (84%, 5%. 3%) respectively. The average annual cost varied by biologic type (SAR 45,360, SAR 33,153) for TNF-inhibitors, and non-TNF inhibitors respectively.

Conclusions

Rheumatoid arthritis exerts considerable economic burden in Saudi Arabia mainly due the cost of biologic DMARDs. Decision maker should consider better approaches to lower the cost of using biologics, in addition examining the cost-effectiveness of these biologics to determine its value for patients and healthcare system.

Exploring the Public Awareness of the Potential Herb-Drug Interactions among Women from Low-Income Communities in Riyadh

Student(s) Name: *Walaa Alotaibi, Shatha Asiri.*
Supervisor(s) Name: *Yazed AlRuthia*

Abstract:

Background

In Saudi Arabia, the use of herbal products especially among women from low income communities is common. However, the public awareness of common drug-herb interactions among this segment of the population is largely unknown. Therefore, the aim of this study was to explore the public awareness of common drug-herb interactions among women from low-income communities.

Methods

This was a prospective cross-sectional study in which women who receive social security assistance or those without private health insurance who visit public clinics or hospitals in Riyadh, Saudi Arabia, were identified. A list of commonly encountered drug-herb interactions was included in a newly created test of 10 questions to explore the awareness of commonly utilized herbs in the Saudi society, such as, black seed and anticoagulants, saffron and antihypertensive medications, and mint and anti-acids. In addition to the test, the participants were asked about their age, the herbs they use, their health status, and the prescription medications they are taking.

Results

The number of participants who consented and completed the interview was 216 females. About 53.24% of the participants reported using herbal products, such as ginger, black tea, myrrah, and anise. Warfarin, heparin, and aspirin were reported to be used by more than 20% of the participants. The participants' mean mini-test score was 1.89±2.04 out of 10.

Conclusions

The use of herbal products is widespread among low income women, however, their awareness of common herb-drug interactions is limited. Launching public campaigns to improve the public knowledge about such interactions is advised.

Measuring Effect of Raising Influenza Vaccination Awareness at Point of Care, Pilot Study

Student(s) Name: *Fawaz bin eid, Abdulrahman althunayan*
Supervisor(s) Name: *Abdullah alzeer*

Abstract:

Background

Seasonal influenza is an acute viral infection caused by influenza viruses; infected individuals are highly contagious and can transmit influenza for 24 h before they are symptomatic. The high infection rate of Influenza made it a major source of morbidity and mortality especially among high risk groups. In this study, we measured the awareness of influenza vaccination among eligible patients and understand the reasons of hesitancy at King Khalid University Hospital.

Methods

This is a cross-sectional study where we measured the awareness and attitude of people toward influenza vaccination and understand the reasons for hesitancy at the outpatient clinics and the waiting area in King Khalid University Hospital. Two trained senior pharmacy students encountered patients at the waiting area with a modified Arabic questionnaire which was administered in an electronic format.

Results

Overall, 317 responses were collected. The age range for participants were from 15-80 years old. Most of the participants were Saudis (88.8%). About 11% of the participants doesn't know what influenza vaccine is. About 43.4% Denied getting vaccinated before. About 25% believed vaccination effect last over one year (one flu season). The main reason for not getting vaccinated is that the patients thinks the vaccine is ineffective (46%) or harmful (19%). Physicians recommendation to take vaccination was the main reason why the patient accepts getting vaccinated (56%).

Conclusions

Flu vaccination hesitancy is a challenge in Saudi Arabia. More effort from healthcare system and

providers toward patient awareness regarding effectiveness, risk and benefit should be dedicated.

Health Related Quality of Life (HRQoL) for Patients with Rheumatoid Arthritis (RA): A Pilot Study

Student(s) Name: *Abdullah A. Alsahli*
Supervisor(s) Name: *Omar Almohammad*

Abstract:
Background
RA is a condition that affects the patients' quality of life. HRQoL is an important tool to assess patients with RA. The short-form 36-item questionnaire (SF-36) was previously validated for patients with RA. We found no studies addressing HRQoL for RA patients in Saudi Arabia. This study aims to establish a baseline for HRQoL for patients with RA in Saudi Arabia using the SF-36 and the EuroQoL.
Methods
A cross-sectional study is undergoing in KKUH t. The study utilized the validated Arabic version of the SF-36 and EuroQol-5D (EQ5D)-5L tools to assess HRQoL among RA patients. Current medications, comorbidities and inflammatory markers (ESR, CRP) were extracted from their files. Analyses were conducted using SPSS. The study was approved by the IRB office at KSUMC.
Results
Fifty-six RA patients participated in the study. Average age was 49.6 (SD=12.8) years, 84% of them were females. Average length of RA was 9.5 (SD=7.2) years, most patients (n=44, 78.6%) were on conventional DMARDs, and 34 patients (60.7%) were on biological DMARDs. patients had an average score of 43.5 (SD=20) on the physical component scale (PCS) and 59.2 (SD=19) on the mental component scale (MCS) from the SF-36. the mean for the visual analogue scale (VAS) in EQ5D was 64.1 (SD=24.6). The PCS and MCS from the SF-36 were highly correlated with the EQ5D domains.
Conclusions
Most patients had an impaired HRQoL. The impairment was more physical than psychological. Data from this study, when completed, can provide a simple tool to assess the patients to assess their condition.

Economic evaluation of liraglutid: systematic review

Student(s) Name: *Khaled aldossry, Khaled aljaman*
Supervisor(s) Name: *Hamoud Almutairi*

Abstract:
Background
Recently, non-insulin medications have been introduced to treat type 2 diabetic patients. Clinically, some of these medications have shown beneficial effects. One such drug, liraglutide, has been studied heavily and shows promising results. Although many studies have investigated the cost-effectiveness of liraglutide versus other non-insulin medications, the results have been inconsistent. Therefore, the main goal of this study is to evaluate the cost-effectiveness of liraglutide in type 2 diabetic patients.
Methods
A comprehensive literature review conducted using the PubMed and Cochrane databases. Only full economic evaluation studies included, and the quality of each study evaluated using the Drummond checklist. Independent investigators collected the data independently and separately.
Results
Eighteen studies evaluating the costs of liraglutide treatment were identified, twelve of which concluded that the drug was cost-effective (CE). Only one study included obese diabetic patients and was not CE. The adjusted ICER range was $7,691 to $92,000 per quality-adjusted life-year in CE studies. Thirteen studies were classified as acceptable based on the Drummond checklist.
Conclusions
The findings of this review suggest that liraglutide is a cost-effective alternative for the treatment of type II diabetes. Further investigation is needed to determine whether it is CE in obese diabetic patients.

Pharmacoeconomic Studies in Saudi Arabia: A Systematic Review

Student(s) Name: *Abdulhadi A. Sabei, Faisal A. Alkhaibari*
Supervisor(s) Name: *Hamoud T. Almutairi*

Abstract:
Background
Recently, Saudi Arabia introduced the 2030 Vision initiative to promote economic efficiency. In medical research, studies evaluating cost-effectiveness are considered one of the most powerful tools for helping decision-makers adopt the best option when allocating resources. To conduct an appropriate CE study, researchers utilize complicated approaches and techniques. Hence, the quality of the studies will vary. Therefore, this study intends to evaluate the quality of pharmacoeconomic studies conducted in Saudi Arabia.

Methods
A systematic literature review of pharmacoeconomic studies conducted in Saudi Arabia will be performed using the PubMed and Cochrane databases. Only full economic evaluation studies will be included. The main elements of these studies will be reported in the review using a standardized sheet, and the methodological quality of the articles will be assessed using the 10-item Drummond checklist.
Results
In total, 709 articles were identified, 17 of which were included in this review. Five studies utilized a cost-effective approach, whereas the others were cost description. Only three studies fulfilled more than five items on the Drummond checklist.
Conclusions
This review suggests that the economic studies conducted in Saudi Arabia are of low quality. In addition, most of the studies do not follow the proper methods for conducting a pharmacoeconomic investigation.

Cost effectiveness analysis of certolizumab in combination with methotrexate in patients with moderate to severe rheumatoid arthritis in Saudi Arabia

Student(s) Name: *Abdullah S. Alothaim*
Supervisor(s) Name: *Ahmad Alghamdi*

Abstract:
Background
Certolizumab is a TNF inhibitor that has shown significant improvement in Rheumatoid Arthritis (RA) progression. The aim of this study was to evaluate the cost effectiveness of certolizumab versus other TNF-inhibitors as add on therapy to methotrexate in the treatment of moderate to severe RA in Saudi Arabia.
Methods
A Markov state transition model was developed to evaluate the cost utility (Cost/QALY) of certolizumab versus other TNF inhibitors. Efficacy (ACR responses) and utility data were collected from published literature. Direct cost were derived from MOH and KSUMC costing data. This study was conducted from a healthcare provider perspective with 15 year time horizon, 6 months model cycle, and 3 % discounting rate. One-way and probabilistic sensitivity analysis were performed. The WTP was assumed to be 3 times Saudi GDP per capital for 2019.
Result
The base case analysis showed that the average lifetime costs for certolizumab, etanercept, adalimumab and infliximab in combination with methotrexate were $412,980, $423,620, $ 435,950, $ 422,303 respectively. In addition, certolizumab regimen had the highest QALY gains (7.11 QALYs) followed by etanercept, adalimumab, and infliximab regimens (6.97, 6.83, 6.35) respectively. The ICER of certolizumab regimen was $36,680 /QALY which dominated all other TNF regimens. The results sensitivity analysis were robust to changes in time horizon, discount rate, drug cost and sensitive to ACR responses (3months vs.6 months).
Conclusions
The result of this analysis indicates that the addition of certolizumab to methotrexate is cost effective compared to other TNF-inhibitors in moderate to severe RA patients in Saudi Arabia.

Health colleges students' attitude towards learning communication skills

Student(s) Name: *Abdulaziz G. Alshehri, Khalid S. Alamri*
Supervisor(s) Name: *Mohamed N. Al-Arifi, Salmeen D. Babelghaith*

Abstract:
Background
Purpose: Communication skills play a principal role in clinical practice. In each clinical setting, health care providers need to meet their patients proficiently and be powerful toward their medical problems.
Objectives: To explore health students' attitudes towards communication skills learning in King Saud University, Riyadh, Saudi Arabia
Methods
This is a cross sectional study that was conducted on a sample of health colleges male students including medical college, pharmacy college, dentistry college, nursing college and applied medical sciences college, at King Saudi university. A convenience sampling procedure over a one-month period in February 2020 was performed to obtain data, which was collected by the Communication Skills Attitude Scale (CSAS), self-administered paper questionnaire in English. It consists of 26 questions, 13 revealing of positive attitude and 13 revealing of negative attitude toward learning communication skills. Data were analyzed using SPSS 24 software.
Results
A total of 402 students returned the questionnaire. The mean score for positive attitude of health

students was 49.7(SD= 6.8) out of 65 and the mean score for negative attitude was 39.2(SD=6.0) out of 65. The comparison between health' college students (pharmacy, medical, dentistry and nursing), there was significant difference in positive attitude among the health college students (p=0.001). Dental students have higher positive attitudes toward communication skills than others health' college students, where medical students showed lowest attitude among health' college students. In addition, there is significant difference between the health' college students for negative attitude (p=0.001). Nursing students had lower negative attitudes toward communication skills than others health' college students.

Conclusions

Although students had positive attitudes toward learning communication skills, curriculum developers and teachers should look for negative attitudes and steps is needed to diminish or if possible eliminate them.

Knowledge of Community pharmacists towards management of patients on Direct Oral Anti-coagulants in Saudi Arabia

Student(s) Name: *Thamer Alnafisah, Qusai Jalal*
Supervisor(s) Name: *Wael Mansy*

Abstract:

Background

Lack of knowledge of community pharmacists about direct oral anticoagulants (DOACs) as indications, contraindications, reversing agents might lead to potential patient harms and may be a barrier toward achieving MOH strategic plan of pharmaceutical care as part of the Saudi vision 2030. Being the most commonly prescribed DOAC, therefore this study was designed to knowledge & awareness of community pharmacists towards management of patients on DOAC in Saudi Arabia.

Methods

A cross sectional survey-based study was carried out among community pharmacists between November 2019 till March 2020. The survey intended to evaluate the knowledge and attitude of CPs towards management of patients with rivaroxaban and was built as an online survey. Chi square test was used for Categorical variables. A p-value <0.05 was considered statistically significant.

Results

A total of 97 community pharmacists responded to the study, all respondents were male, non-Saudi (94.7%) and working within chain pharmacies (97%). Although almost all respondents 88 (76%) correctly identified that rivaroxaban shown effective anticoagulant effect as convectional therapy with warfarin, there was a significant difference in knowledge of hemostatic agents ($p < 0.001$) as well as safe use of DOACs before invasive procedures ($p < 0.04$) that might lead significant patient harm.

Conclusions

The results of our cross sectional survey demonstrate that there is gap in knowledge between community pharmacists in awareness of hemostatic agents and counseling regarding DOACs. Further studies should focus on raising community pharmacists' knowledge about all DOACs.

The Physician's and family's point of view towards diabetic medication adherence

Student(s) Name: *Nora Aldosary*
Supervisor(s) Name: *Nouf Alodah*

Abstract:

Background

Lack of knowledge of community pharmacists about direct Medication non-adherence is a growing concern to physicians, healthcare systems, and other stakeholders. There is an increasing evidence associated with medication non-adherence adverse outcomes resulting into higher costs of care. Diabetes Medication adherence in Saudi Arabia was reported to be less than 40% in one of the best centers to manage diabetes. Patient's point of view toward medication adherence was explored previously. This study aims to explore diabetes adherence from point of view of the social circle rounding patients with diabetes: the physician and family members.

Methods

An in depth face to face interviews were undertaken. The topic guide questions were developed from literature-review. A purposeful sampling was undertaken using the matrix presented below. The sample was recruited from King Khalid University Hospital, and King Abdulaziz University Hospital as listed on the table.

Conclusions

Medication adherence is a huge and complex phenomenon. This is the first study that explores diabetes medication adherence from the point of view of the social circle that surround patients. Results are still ongoing.

physicians (should be worked for at least one year :-	The 12 family members are :-
4 endocrinologist (2 males and 2 females)	2 wives , 2 husbands of a diabetic patient
4 clinical pharmacist(2 males and 2 females)	2 fathers , 2 mothers of a diabetic patient
4 of primary health care providers(2 males and 2 females)	2 daughters and 2 sons of a diabetic patient

Computational Approach for Screening the Activity of Some Natural Products Against Substances Addiction

Student(s) Name: *Abdullah A. Albassam*
Supervisor(s) Name: *Mohamed F. AlAjmi*

Abstract:

Background

Substance addiction is a significant worldwide concern. One hallmark of drug abuse disorder is the high rate of relapse following detoxification. There are no FDA approved medications to treat the relapse. In this study, we tried to identify novel inhibitors of phosphodiesterase 4 (PDE4) enzyme using a computational approach. PDE4 has been proposed as a potential target for the treatment of opioid, alcohol and psychostimulant drug abuse.

Methods

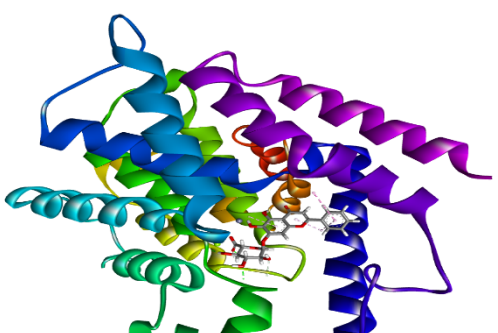
The natural compound library from Selleck Inc was screened against PDE4 using Schrodinger's Glide. HTVS screening was performed followed by SP and XP docking. The physiological and ADMET properties of the top 5 compounds were determined using PubChem and Qikprop respectively. MM-GBSA was calculated to evaluate the solvent effect on enzyme-ligand complex stability. Enzyme-ligand complex with lowest MM-GBSA score was subjected to molecular dynamics (MD) simulation using Desmond.

Results

Top 5 natural ligands identified were Salvianolic acid, Baicalin, Amentoflavone, Nadide and Icariin having a docking score of -15.098, -14.450, -13.507, -13.395 and -12.470 kcal/mol respectively. Analysis of physiological and ADMET properties revealed that only Baicalin obeyed Lipinski's rule of 5 and thus has drug-like properties. MD simulation of PDE4-baicalin showed that the complex was stable. Baicalin formed three hydrogen bonds (Asn283, Glu304 and His278), one hydrophobic interaction with Phe446, two salt bridges, or electrostatic interaction with Mg and one metal coordination bond with Mg.

Conclusions

Baicalin is a natural compound with drug-like properties. It has a good affinity towards PDE4 and thus could be developed as a therapy against the substance of abuse.



Design, synthesis and biological evaluation of selective cyclin-dependent kinase 9 inhibitors as anticancer agent

Student(s) Name: *Abdulrahman A. Alfaleh*
Supervisor(s) Name: *Hamad Alkahtani*

Abstract:

Background

Cyclin-dependent kinases (CDKs) are a family of protein kinases that are involved in the regulation of cell cycle and transcription. CDK9 is the catalytic subunit of the positive transcription elongation factor b (P-TEFb) which is responsible for phosphorylation of RNA polymerase II (RNAP II) to promote transcription. Inhibition of transcription via CDK9 inhibition leads to reinstatement of apoptosis in cells treated with CDK9 inhibitors.

Methods

Sixteen compounds were synthesized and evaluated for their inhibitory activities against CDK9. MTT assay was used to evaluate cytotoxicity against MCF-7, HT29, HL-60, and K562 cancer cell lines as well as the normal cell line MRC-5. Moreover, molecular docking was performed in order to rationalize the observed potent inhibitory activity of compounds 7 and 9 against CDK9 using the crystal structure of CDK9 (PDB: 3BLR).

Results

Compounds 1-16 showed promising CDK9 inhibitory activities (IC50 values < 0.5 µM) with compounds 7 and 9 being the most potent inhibitors (IC50 values of 0.062 and 0.075 µM, respectively). In addition, the compounds showed potent cytotoxic activities with average IC50 value less than 5 µM against the tested cells. Molecular docking showed that substituted benzenesulfonamide moiety enhance the potency of quinazolinones against CDK9.

Conclusions

We synthesized and evaluated 16 derivatives of 2-[(3-(4-sulfamoylphenethyl)-4(3H)-quinazolinon-2-yl)thio]anilide (1–16) for their CDK9 inhibitory activity as well as cytotoxicity against several cancer cell lines. They exhibited potent CDK9 inhibitory activity which was accompanied by cytotoxic effects

against the tested cell lines. Finally, compounds 7 and 9 are good candidates for further preclinical optimization.

Investigation of the biological activities of Crepis flexuosa

Student(s) Name: *Mohammed K. Al-Meshari, Turki A. Al-Harbi*
Supervisor(s) Name: *Mohammed S. Al-Dosari, Mohammad K. Parvez*

Abstract:
Background
Crepis (family: Asteraceae) is a large genus of cold-adapted plants, distributed in the high-altitude northern hemisphere. There is very limited knowledge on the traditional use of Crepis rueppellii, C. vesicaria, C. carbonaria, C. cameroonica and C. sancta against some human diseases. C. flexuosa (Ledeb.) Benth. (syn. C. glouca, Barkhausia flexuosa, Youngia flexuosa, Y. glouca) is a shrub, grown in the Himalayan ranges (3000-4200 m, a.s.l.) of Central Asia, Tibet, Pakistan and India. In the Indian Spiti valley, C. flexuosa juice is used to cure jaundice. Here, we experimentally investigated the in vitro biological activities of C. flexuosa total-ethanolic extracts and its fractions.
Methods
The aerial parts of C. flexuosa were collected from the Nubra-Pangong area (3200 m) of Ladakh, India. The dried-grounded material was extracted in 96% ethanol (8.1g) following hexane (1.3 g), ethyl acetate (0.8 g), n-butanol (0.8 g) and aqueous (4.1 g) fractionations. All fractions prepared in DMSO (0.1%, final) and culture media DMEM (25, 50, 100 and 200 µg/ml) were tested on human hepatoma cells (HepG2) in 96-well plates. Two days post-treatment, cell viability was assessed using MTT kit, and the cytotoxicitiy concentration (CC50) values determined.
Results
The ethyl acetate fraction was non-cytotoxic even at the maximal dose (200 µg/ml) whereas the aqueous (CC50=62.5 µg/ml), hexane (CC50=88.3 µg/ml) and n-butanol (CC50=112.2 µg/ml) fractions showed dose-dependent cytotoxicity.
Conclusions
This is the first report on the cytotoxic activity of C. flexuosa, except the ethyl acetate fraction, suggesting its further biological and phytochemical studies towards identifications of active principles.

Cytotoxic and antioxidant activities and phytochemical screening of Mimosa pigra and Teucrium oliverianum

Student(s) Name: *Mohammed Alrawdhan, Meshal Almutairi*
Supervisor(s) Name: *Ramzi Mothana*

Abstract:
Background
Plants have served as important sources of effective anticancer agents and over 60% currently used anticancer agents were isolated from natural sources, including plants, marine organisms and microorganisms or are related to them. Lately, the uses of herbal medicines are increasing rapidly in developed countries. Therefore, this study aimed to investigate the cytotoxic and antioxidant activities of two medicinal plants used in folk medicine namely, Mimosa pigra and Teucrium oliverianum and to carry out a phytochemical screening.
Methods
Both plants were collected from different localities and extracted with methanol using maceration. Evaluation of the cytotoxic activity was done against human breast adenocarcinoma cell line (MCF-7) by using MTT assay. The antioxidant activity was determined using two different methods namely 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging, and ABTS assays. Moreover, a phytochemical screening of the methanolic extracts was carried out using thin layer chromatography (TLC).
Results
Notable cancer cell growth inhibition was observed with the extract of M. Pigra with IC50 of 92.4 µg/ml where the extract of T. Oliverianum showed only a weak activity (258.1 µg/ml). Both plants showed a moderate antioxidant activity in both assays (63%-75%). The phytochemical screening showed the presence of terpenoids and flavonoids as major active constituents in both plants.
Conclusions
Our results show once again that medicinal plants can be promising sources of natural products with potential anticancer and antioxidative activities. Further work is needed for the isolation and identification of the active compounds in Mimosa pigra.

Synthesis and Evaluation of Coumarin-4-acetamide Derivatives as Potential Antimicrobial Agents

Student(s) Name: *Nora S.Almubarak, Nouf T. Alshammri*
Supervisor(s) Name: *Maha S. Almutairi, Reem I. Alwabli*

Abstract:

Background

Antimicrobial resistance presents a global threat that challenges modern medicine. The primary goal of this study is the development of a new coumarin-4-acetic acid nucleus as a precursor to combat the ever-growing antimicrobial resistance problem.

Methods

The coumarin-4-methyl acetate (I) has been synthesized according to the reported procedure. Consequently, the reaction of various commercially available aromatic amines with the carboxylic acid group of the coumarin-4-acetic acid scaffold (II) afforded the respective N-substituted-coumarin-4-acetamides IIIa-c.

The target compounds IIIa-c were tested for their in vitro antimicrobial activity, in a standard disk diffusion assay (DIZ), against two strains of bacteria (S. Aureus &E. Coli) and C. Albicans as a fungal strain. Trimethoprim/Sulphamethoxazole (SXT) combination was used as a reference standard.

Results

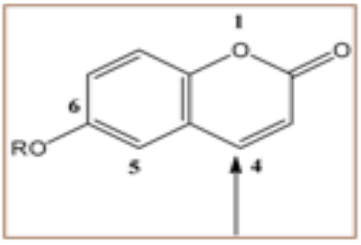
Three new final compounds IIIa-c have been synthesized along with two key intermediates., and all of their spectroscopic analysis fully supported the proposed structures.

The tested compounds IIIa-c showed moderate to marginal antibacterial activity. Compound IIIa showing a reduction of bacterial growth with a DIZ value of 18 mm against S. Aureus and 12 mm against E. Coli comparable to the activities of the standard SXT against the same pathogens. Compounds IIIb, c exhibited low antibacterial activities, while among the tested compounds, only compound IIIb displayed inhibition zone of 6 mm with C. Albicans.

Conclusions

Compound IIIa exhibited significant antibacterial activity, while all of them showed low or no antifungal activities. Further modification of the coumarin-4-acetamide scaffold will give new derivatives with a promising candidate for next-generation antibacterial development.

Structure:



Chemical Targets of the Present Research Work

Screen for Potential Inhibitor for Protease Enzyme Using Crystal Structure of MERS Virus

Student(s) Name: *Mohammed A. alghamdi*
Supervisor(s) Name: *Nawaf alsaif, Ahmed hassan*

Abstract:

Background

A protease is an enzyme that catalyzes and increase the breakdown of proteins into smaller polypeptides or single amino acids, protease is essential for viral replications, consequently, it is an attractive target that provides a potentially effective inhibitpor for the active site of virus

Methods

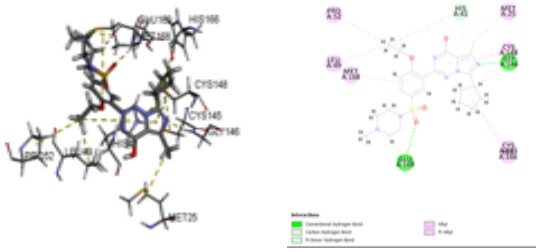
Selected about 3650 compounds library from CHEMBL database through virtual screening and flexible docking simulation. rule of five and toxicity tests applied on the compounds , after Lipinski test we had 2306 compounds, and those 2306 compounds went through toxicity tests and 574 compounds left with us , those compounds collected with 5 clusters each to the docking simulation and molecular dynamic simulation to choose 10 most high affinity to the active site of the protease enzyme.

Results and Conclusions

List of the ten high affinity compounds for protease enzyme:

Compounds code	Energy minimization	Compounds code	Energy minimization
1- CHEMBL2016884	-9.2901	2- CHEMBL1349143	-8.666
3- CHEMBL1475125	-8.6577	4- CHEMBL414842	-8.2643
5- CHEMBL3431576	-8.2265	6- CHEMBL3589911	-8.21889
7- CHEMBL595462	-8.16305	8- CHEMBL159072	-8.08010
9- CHEMBL360003	-7.84797	10- CHEMBL1729935	-7.7018

In conclusion, the study showed that Sildenafil have higher affinity to the active site of the protease enzyme and it will be good candidate for further investigation.



PDB CODE: 5WKK

Evaluating the ability of bat blood to inhibit hair growth in neonatal rat

Student(s) Name: *Eshraqha G.Mohamed, Rawan F. Abdalla, Sarah A. Abdul Jawwad*
Supervisor(s) Name: *Aliyah A. Al-momen, Raha S.Orfali*

Abstract:

Background

Animal-derived remedies constitute an important branch of traditional/folk medicine. One of these remedies is using bat blood to inhibit hair growth. A myth from different cultures including southern region of Saudi Arabia reported that the application of bat blood on neonate skin could suppress hair growth permanently. In view of this, our study aims to investigate the effectiveness of bat blood in preventing hair growth, by proving or denying this myth.

Methods

The study will be designed on 25 neonate rats and 10 adult rats. The Bat blood will apply topically on neonate and adult rat skin. Laser, Nair cream and mice blood will apply topically and will be served as control groups for comparison. CBC and histology test will be performed to detect the effectiveness of bat blood application related to control groups.

Results

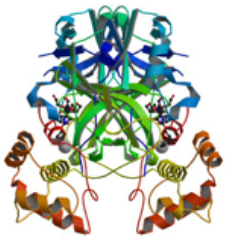
Results were not obtained due to circumstance the country and the rest of the world are passing through due to the spreads of COVID-19 virus. Thus, the study is placed on hold for the time being.

Conclusions

In recent years, bats have been recognized as important reservoirs of highly pathogenic viruses for human and other animals such as SARS coronavirus, Hendra and MERS4.

Although direct evidence is still lacking the effect of bat blood for inhibiting hair growth permanently, the study does not recommend people to practice this myth because it can transfer these viruses to babies.

Synthesis and Anti-HCV activity of newly benzo[g]quinazolines



Student(s) Name: *Mohamm*
Supervisor(s) Name: *Hatem*

Abstract:

Background

Hepatitis C virus (HCV) mort
globe health concern. HCV
disease and considered as the major cause of liver cirrhosis and hepatocellular carcinoma. There is a continuous need to improve and optimize current HCV therapy and develop novel agents and drug classes. The HCV NS3/A4 protease plays an essential role in HCV replication. Thus, HCV NS3/A4 protease inhibition one of the best therapeutic targets for the identification of new drug candidates.

Methods

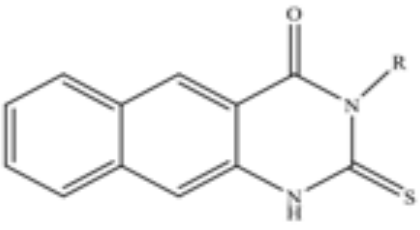
Herein, a series of benzo[g]quinazolines are synthesized using alkylisothiocyanates and 3-naphthaoic acid as starting material. Their structures are characterized by NMR and MS spectra. Chemical transformation of the thioxo group in the parent compounds (1-4) provided an access to new derivatives (5-8). The targets (1-8) are evaluated for their HCV-NS3/4A inhibitory activities in vitro assay.

Results

The obtained results revealed that all compounds showed good activity against NS3/4A enzyme giving IC50 ranged between 1.64±0.03 and 22.25±0.48 ug/ml in comparison to Telaprevir (1.17±0.02 ug/ml) as standard reference. Compounds 1 and 8 showed the highest activity (IC50 = 1.64±0.03 and 2.31±0.05 ug/ml).

Conclusions

The target benzoquinazolines could be useful as templates for further development through modification or derivatization to design more potent HCV-NS3/4A protease inhibitors.



R : methyl, ethyl, butyl, phenethyl

Experimental Therapeutics and Toxicology

The Clinical Significance of Non-Homologous End Joining Gene Expression as a Prognostic Tool to Predict Early Chemotherapy Resistance in Relapsed Acute Lymphoblastic Leukemia Patients

Student(s) Name: *Basil J. Alotaibi*
Supervisor(s) Name: *Homood M. As Sobeai*

Abstract:
Background
Increased NHEJ DNA repair capacity has been linked to chemoresistance. consequently, cancer patients relapse and poor prognosis. Therefore, identifying patients with high NHEJ repair capability and tailoring their regimens are crucial to overcoming resistance. In this study, we investigated the impact of NHEJ gene expression on patient recurrence and disease-free survival rate in pediatric ALL patients.
Methods
The expression of 17 NHEJ genes was extracted from two microarray datasets of precursor-B-ALL patients (Hogan et al. dataset (GSE28460) included 49 patients and Staal et al. dataset (GSE18497) contained 27 patients). The datasets were processed using the RMA method in RStudio (1.2.1335). Patients were stratified into two groups: early and late relapsers, 36 months is assigned as cutoff. The expression of NHEJ genes was compared retrospectively at their time of diagnosis using the student's t-test. Survival analysis was performed using log-rank test. A p-value of less than 0.05 is considered statistically significant.
Results
In Staal dataset, 15 out of 17 NHEJ genes were upregulated, five were statistically significant. In Hogan dataset, 14 genes were upregulated, and nine were statistically significant. PRPF19, XRCC4, and XRCC5 were significantly overexpressed in both datasets. Patients with high expression of the three shared genes were 2.02 and 2.51 more likely to relapse earlier than patients with low expression in Hogan and Staal datasets, respectively.
Conclusions
NHEJ pathway is intrinsically upregulated in early-relapsing precursor-B-ALL patients and associated significantly with relapse time. PRPF19, XRCC4, and XRCC5 have the potential to be used as a prognostic tool and rationale for alternative therapeutic strategies.

Elucidating the effect of BCL-2 inhibition on the heart function

Student(s) Name: *Muath AlMeaikl*
Supervisor(s) Name: *Abdullah AlAsmari*

Abstract:
Background
Venetoclax (VTX) is an anticancer drug that is currently used to treat certain types of cancer, such as chronic lymphocytic leukemia and small lymphocytic lymphoma. Considering its mechanism of action, which is inhibition of BCL-2 protein, the possibility that venetoclax may cause cardiotoxicity cannot be ruled out. Therefore, investigating the effect of BCL-2 inhibition on the heart function and whether venetoclax can result in cardiotoxicity is of paramount importance.
Methods
twenty-four male albino rats were divided into 3 groups: control group (received i.p injection of normal saline), low dose of venetoclax group (received i.p. injection of 50 mg/kg venetoclax), and high dose of venetoclax group (received i.p injection of 100 mg/kg venetoclax). After 21 days, blood and tissue samples were collected for histopathological, biochemical, gene and protein analysis
Results
Venetoclax treatment resulted in cardiac damage as evidenced by histopathological studies. Furthermore, serum Creatine kinase-MB and cardiac Troponin-I were significantly increased in both groups of venetoclax with the highest increase was observed in the high dose group. Furthermore, venetoclax treatment markedly reduced the activity of the anti-oxidant enzyme catalase and induced the levels of the oxidative stress marker lipid peroxide. Moreover, we demonstrated a significant increase in the gene expression of transforming growth factor-beta, tumor necrosis factor-alpha, and myeloperoxidase, indicating the presence of cardiac damage.
Conclusions
Our study is the first to report the cardiotoxic effect of venetoclax. Further experiments and future studies are strongly encouraged to comprehensively understand the cardiotoxic effect of venetoclaxc.

Cytotoxic and apoptotic effects of Centaurothamnus maximus and Artemisia absinthium on human liver (HepG2) and lung (A549) cancer cells

Student(s) Name: *Mohammed A. Almalki*
Supervisor(s) Name: *Ahmed Z. Alanazi*

Abstract:

Background
Plants have been shown to be a great source of new drugs, including anticancer agents. Centaurothamnus maximus and Artemisia absinthium are known to possess different therapeutic values. Here, we investigated the anti-cancer effect of C. maximus and A. absinthium on two different human cancer cells (liver, HepG2) and (lung, A549).
Methods
The plants were collected and extracted with 80% ethanol. The anticancer activity of C. maximus and A. absinthium ethanolic extracts were evaluated using MTT assay. Apoptotic cells deaths in A549 cells were detected using an Annexin-V-fluorescein isothiocyanate (FITC)/propidium iodide (PI) detection kit.
Results
We demonstrated that C. maximus extract inhibits the proliferation of both cell line in a concentration dependent manner with IC50 values 22.2 and 23.4 µg/ml against A549 and HepG2 cells respectively, while A. absinthium extract does not display any activity. Annexin V-FITC/PI staining analysis revealed an induction of apoptosis in A549 cells and an increase in population of early and late apoptosis were observed after treatment with ethanolic extract in compare to untreated cells.
Conclusions
This study revealed that ethanolic extract of C. maximus exerted anticancer activity in A549 lung and HepG2 cancer cells through inhibiting the growth of both cancer cells and induction apoptosis in A549 only. Extensive chemical identification of the constituents from C. maximus will clarify the compounds responsible for these activities.

Role of Rivaroxaban in nephrotoxicity induced by Sunitinib via modulation of oxidative stress and inflammation through NF-κB signaling pathways

Student(s) Name: *Abdul Aziz Almordhi, Majid Al-Mutairy*
Supervisor(s) Name: *Naif O. Al-Harbi*

Abstract:
Background
Sunitinib (SUN) is FDA approved first-line drug for metastatic renal cancers and advanced cancerous states of gastrointestinal tract. Use of sunitinib are limited due to its renal adverse events include proteinuria, thrombotic microangiopathy and acute interstitial nephritis complicated by thrombocytopenia. Rivaroxaban (RIVA) inhibits factor Xa, approved for deep vein thrombosis and has been reported to have anti-oxidant and anti-inflammatory activities via several endogenous signaling molecules. Therefore, this hypothesis was aimed to examine the nephron-protective potential of RIVA in SUN-induced nephrotoxicity, mediated through the inhibition of oxidative stress and inflammation, through NF-κB signaling pathways.
Methods
Adult male Wistar rats 200-250 g were selected and divided randomly in 5 groups (n=6): Group 1 kept as normal control; Group 2 as disease control and exposed to SUN 50 mg/kg thrice-weekly upto 21 days; Groups 3 and 4, were treatment groups and received SUN (as group 2) after administration of RIVA 5 and 10 mg/kg/daily respectively for 21 days; and Group 5 fed with RIVA alone (10 mg/kg/daily for 21 days).
Results
SUN exposure caused significant changes in serum biochemical parameters and alteration in oxidative stress parameters such as Malondialdehyde (MDA), glutathione (GSH) levels, catalase (CAT) glutathione reductase (GRase) activity. Intracellular caspase-3 and TNF-α levels were also increased. The alteration in the above parameters were restored by RIVA treatment. SUN-exposed abnormally regulated signaling molecules at cellular level (such as NFk-B, IL-17, MCP-1, and IKBα levels) which were corrected by RIVA treatment.
Conclusion
Sunitinib mediated oxidative stress and inflammation were reduced by RIVA treatment through NF-κB signaling pathways in renal tissues.

Maraviroc, a selective and potent C-C chemokine receptor 5 antagonist, attenuates collagen-induced arthritis through downregulating signaling of RORγT/IRF4 transcription factors

Student(s) Name: *Faris S. Alyousef, Mohammed A. Alswailem*
Supervisor(s) Name: *Saleh A. Albakheet, Mushtaq A. Ansari, Sheikh F. Ahmad*

Abstract:
Background
Rheumatoid arthritis (RA) is one of the major autoimmune diseases with a global prevalence. Despite significant research into RA disease, no drugs with acceptable safety profiles are yet available for its treatment. We investigated the possible anti-arthritic effects of the maraviroc

(MVC) to explore the role of C-C chemokine receptor 5 antagonist in a mouse model of collagen-induced arthritis (CIA) in DBA/1J mice.

Methods

Following induction of CIA, animals were treated with 50 mg/kg MVC intraperitoneally daily from day 21 until day 35 and evaluated for clinical score, and histological hallmarks of arthritic inflammation. We further investigated the effect of MVC on IL-9, IRF4, GATA3, IL-21R, IL-17A, RORγT, TNF-α, and RANTES cells using flow cytometry. We also assessed the effect of MVC on both mRNA and protein levels using RT-PCR and Western blot analyses of knee samples.

Results

The severity of clinical scores, and histological inflammatory damage decreased significantly in MVC-treated compared with CIA control mice. MVC treatment in CIA mice decreased IL-9, IRF4, IL-21R, IL-17A, RORγT, TNF-α, and RANTES production but increased GATA3 production in CD8+ T cells. We further observed that MVC-treatment downregulated IL-9, IL-17A, and RORγT, whereas it upregulated GATA3 mRNA and protein levels.

Conclusions

The results of the present work indicate that MVC exhibits significant anti-inflammatory and anti-arthritic, suggesting that MVC may have novel therapeutic uses in the treatment of RA.

Examining Autophagy Machinery in the Hippocampus of Depressed Rats

Student(s) Name: *Noura Aldhargham, Nouf Alanazi*
Supervisor(s) Name: *Tahani alshammari, Nouf Alrasheed*

Abstract:

Background

Depression is a reasonably common mood disorder. It is the second major cause of disability. Most of the current treatment strategies focus on the monoamine theory of depression pathophysiology. They were found by serendipity, and they face significant limitations such as efficacy, relapse, and side effects. Thus, there's an urgent need to develop new drugs. Recently autophagy machinery has gained interest in the field of psychiatric disorders. Autophagy is a complex defensive mechanism that ensures protein homeostasis through the lysosomal degradation of misfolded proteins. A recent study reported that treatment with insulin sensitizer reduces depressive-like phenotypes via autophagy in a chronic mild stress mouse model. Thus, we carried our research to address whether autophagy is involved in the pathology of depression and whether targeting autophagy would improve the current treatment strategies.

Methods

Our study utilized four rat groups, 1) Depressed rats(six weeks socially isolated rats);2) depressed and acutely treated with fluoxetine (25 mg/kg po for one week); 3) control rats (housed in socially standard conditions); 4) control treated with fluoxetine. After six weeks, we sacrificed the animals, isolated the hippocampus, extracted the RNA, then converted it to cDNA. Followed by running RT-PCR experiments using 11 primers of autophagy machinery representing members at elongation, transporting, and degradation stages and compared it to a housekeeping control gene, the GAPDH gene.

Conclusions

Our analysis revealed that some members of autophagy are altered. However, these changes are modest. Suggesting that autophagy might not be directly involved in the pathology of depression in our animal model.

The Protective Role of Sesame Oil against Parkinson's -Like Disease Induced by Manganese Neurotoxicity in Rats

Student(s) Name: *Rawan Alhaider, Esraa Raiyhan, Noura Aldhargham*
Supervisor(s) Name: *Hala A. Attia, Hatun A. Alomar, Hazar Yacub*

Abstract:

Background

Despite its essentiality, chronic exposure to manganese) Mn) results in motor dysfunction and Parkinson's like symptoms. The pathophysiology include the dysfunction of dopaminergic and GABAergic systems, oxidative stress & inflammation that stimulate proteins called activating transcription factor-6 (ATF-6) and protein kinase RNA-like ER kinase (PERK) leading to dysfunction of endoplasmic reticulum and finally apoptosis. This study aimed to investigate the protective effect of sesame oil (SO) against Mn-induced neurotoxicity.

Methods

Rats were divided into normal controls, model group (injected with 25 mg/kg $MnCl_2$ i.p. daily for 5 weeks) and SO-treated groups (2.5, 5 and 8 ml/kg SO + $MnCl_2$ daily for 5 weeks). Open field and rotarod tests were performed to evaluate motor activity. Striatum was separated for ELISA assay of dopamine, GABA, lipid peroxides, antioxidants, inflammatory cytokines, apoptotic markers (caspase-3, BAX and Bcl-2) and western blot analysis

of PERK and ATF-6. Pathological changes were detected using H&E staining.

Results

Mn –induced motor dysfunction was indicated by significant decrease in the time taken by rats to fall (in rotarod test) and in the number of movements (in open field test). Mn significantly reduced the levels of dopamine and Bcl-2, while, GABA, inflammatory cytokines, PERK, ATF-6, BAX and caspase-3 significantly elevated. Histological examination revealed many degenerated cells. Interestingly, all doses of SO significantly improved motor activity& biochemical deviations and reduced the neuronal degenrtaion (particularly with 8 ml/kg)

Conclusions

Supplementation of SO could be a pharmacological way to enhance the motor activity and neuronal survival in people highly exposed to Mn.

Effects of single and co-exposure to amphetamine and cannabis on the kidney functions and ions in Saudi addicted populations

Student(s) Name: *Khaled S. Alsawadi, Ahmed N. Ghabban*
Supervisor(s) Name: *Fawaz Alasmari*

Abstract:

Background

Amphetamine and cannabis addiction is common in numerous countries, including Saudi Arabia. Reducing the progression of amphetamine and cannabis dependence could provide beneficial consequences clinically and economically. Studies found positive correlation between neuropsychiatric diseases and dysregulated blood metabolites/ions levels in humans. Schizophrenia is associated with altered metabolic pathways of amino and fatty acids. However, little is known about the effects of cannabis and/or amphetamine on the levels of essential ions in the blood.

Methods

Four groups, control, amphetamine, cannabis and amphetamine-cannabis, were involved in the study. Blood samples were obtained from the individuals and the all experimental procedures were approved by the Institutional Review Board (IRB) of AlAmal Mental Health Complex in accordance with the guidelines of the IRB Committee. Complete blood count (CBC) and lipid profile were determined. Detection of kidney functions, serum ions, total protein and carbon dioxide (CO2) was performed using EISA-based technology.

Results

The statistical analysis revealed that lipid parameters, CBC and kidney functions are within normal values and no significant changes between these four groups. We found that cannabis and/or amphetamine increased the serum level of CO2. Moreover, total protein level was reduced in amphetamine group as compared to healthy control. Additionally, phosphate and chloride serum levels were increased significantly in cannabis exposed groups. Cannabis also was able to increase the serum level of sodium.

Conclusions

Our work suggest that chronic exposure to cannabis and amphetamine induced dysregulation on the serum levels of ions, total protein and CO2 without affecting kidney functions.

Evidence for Involvement of Histamine in Breast Cancer Related Angiogenesis

Student(s) Name: *Alanood Alsehli, Heba Abu-Obaid*
Supervisor(s) Name: *Layla Alkharashi, Gamrah Alqahtani*

Abstract:

Background

Angiogenesis play an important role not only in the development and progression of breast carcinomas, but also in their prognosis and treatment. Therefore, targeting this pathway through suppressing their main regulatory proteins is mandatory for improving the current therapies. To this end, we investigated the role of histaminergic pathway in regulating angiogenesis by studied the effect of H-2 blocker on triple negative breast cancer cells.

Method

We tested the anti-angiogenic effect of Ranitidine on MDA-321 cells. The cells were treated with either control vehicle, histamine 10 µM or combination of histamine 10 µM and ranitidine in 10 and 20 µM. The total protein was extracted from the cells for western blot (WB) and the media conditioned with the treated cells subjected for ELISA measurement of VEGF-A, and utilized for in vitro HUVEC angiogenesis test.

Results

The addition of the H2-blocker significantly suppressed both the expression levels of HIF-1α and VEGF-A as evidenced by WB, and the secreted level of VEGF-A protein in conditioned media (CM) as determined by ELISA. In addition, differentiation of HUVEC cells into primitive capillary-like structure occurred in the presence of Histamine-CM, while it

was strongly inhibited in the presence of H2-blocker - CM.

Conclusion

These findings have provided significant proof that histamine regulates angiogenesis by increasing the pro-angiogenic factors HIF-1α and its downstream effector VEGF-A in MDA-MB-231 cells, while Ranitidine suppressed them leading to angiogenesis suppression. Targeting this pathway as an adjuvant therapy could possibly offer potential novel targets in future anti-cancer therapies.

Investigating the Role of Scavenger Receptor Type A in Neuronal cells-Zinc Oxide Nanoparticles Interaction

Student(s) Name: *Moflih A. Al Sagir*
Supervisor(s) Name: *Abdullah A. Aldossari*

Abstract:

Background

The use of nanoparticles is rapidly expanding and incorporated into different fields. Zinc oxide nanoparticles are one of the most utilized form of nanoparticles due to their unique properties. Zinc oxide nanoparticles are often used in dental materials such as root canal filings. The increase use of zinc oxide nanoparticles in oral cavity provide a potential route for zinc oxide nanoparticles to translocate into the body via different pathways such as olfactory nerve. This translocation of nanoparticles may lead to toxic effect on human body. Different types of receptor have been reported to play important role in cellular interaction with nanoparticles such as scavenger receptors and toll-like receptor.

Methods

PC-12 cells will be used as neuronal cell model to investigate the role of scavenger receptor type A. Dextran will be used as scavenger receptor type A blocker to evaluate the role of the receptor. In this study we will perform MTT assay to determine the cellular viability, DCF-DA to determine reactive oxygen species level, and ICP-MS to evaluate cellular uptake of zinc oxide nanoparticles uptake.

Results

Our results for MTT assay indicate that the cell viability decreased following zinc oxide nanoparticles exposure and while the pretreated cells with dextran showed no decrease in cell viability. The results of DCF-DA assay and ICP-MS still to be determined.

Conclusions

Our findings suggest that scavenger receptor type A play an important role in neuronal cells-zinc oxide nanoparticles interaction which will help in understanding the toxicity mechanism of zinc oxide nanoparticles.

The Hepatoprotective Effects of Chrysin in Animal Model of Non - Alcoholic Fatty Liver. The Impact on Angiotensin Converting Enzyme 2/Angiotensin 1-7/ Mas Axis

Student(s) Name: *Layal Albdeirat, Arwa Soliman, Reem Rajab*
Supervisor(s) Name: *Hala A Attia, Amira Badr*

Abstract:

Background

Non-alcoholic fatty liver disease (NAFLD) is the build-up of extra fat in liver due to insulin resistance. Oxidative stress, inflammation and the activation of classical arm of renin angiotensin system (RAS) contributes to NAFLD. However, the alternative arm of RAS named angiotensin (Ang) converting enzyme 2 (ACE2)/Ang 1-7/Mas receptor counteracts the classical axis and improves hepatic lipid metabolism rendering it a promising protective target. This study aimed to investigate the impact of chrysin, a potent antioxidant flavonoid, on this protective axis in NAFLD.

Methods

Rats were weighed and treated daily as follow: normal controls, NAFLD model (20% fructose in drinking water), treated groups (25 and 50 mg/kg chrysin given concomitantly with fructose). After eight weeks, rats were reweighed, serum levels of liver enzymes, glucose and triglycerides (TG) as well as hepatic levels of TG, oxidative stress, inflammatory markers, ACE2, Ang 1-7 and Mas were determined using colorimetric and ELISA kits. Structural changes were detected by H&E staining.

Results

High fructose resulted in significant weight gain, hepatocyte degeneration, inflammatory infiltration and accumulation of lipid droplets (as revealed by H&E). Serum TG & glucose and hepatic levels of TG, lipid peroxides, and inflammatory markers were markedly elevated, while levels of ACE2, Ang 1-7 and Mas were significantly reduced. Chrysin (25 and 50 mg/kg) significantly attenuated these abnormalities with a prominent effect of 50 mg/kg on improving the levels of glucose, TG, ACE2, Ang 1-7 and Mas.

Conclusions

Chrysin could be used for efficient protection from NAFLD via enhancing ACE2/Ang 1-7/Mas axis.

Phospholipid scramblases1 may work as apoptosis indicator to assess damage to Dermal Mesenchymal Stem Cells under different condition

Student(s) Name: *Noorah Almohaimeed, Rahaf Qadadeh*
Supervisor(s) Name: *Layla Alkharashi, Qamraa Alqahtani, Bahauddeen Alrfaei*

Abstract:
Background
Apoptosis is a normal process that maintain tissue homeostasis. It plays an essential role in morphogenesis, and wound healing. Defects in apoptosis contribute to carcinogenesis, and scleroderma. However, little is known about the regulation of apoptosis in dermal mesenchymal stem cells (MSC). phospholipid scramblase-1 (PLSCR-1) is a powerful regulator for apoptosis. It is a member of transmembrane family proteins involved in phospholipid ''scrambling'' between the leaflets of the plasma membrane, found in all tissues except brain. PLSCR-1 participates in cell proliferation, differentiation, and apoptosis. Since PLSCR-1 mechanism is not understood, we investigated the effect of different growth conditions on PLSCR-1 expression within dermal MSC.
Methods
Dermal MSC (Hs27) were seeded at 25,000 cells per well and starved for 24 hours. Then, grouped into 7 groups (n=3), subjected to different growth conditions: 20 pg of each Epidermal growth factor (EGF), fibroblast growth factor (FGF), Leukemia inhibitory factor (LIF) and Insulin, beside overgrowth and starvation conditions. The control group was supplemented with 10% fetal bovine serum plus EGF. After 24 hours, total RNAs were isolated, then PLSCR-1 expression level was measured using Real-time polymerase chain reaction (qPCR).
Results
PLSCR-1 expression levels increased by 200% and 300% in overgrowth and starvation conditions respectively. Whereas LIF and Insulin showed an increase in expression 30% and 40%) respectively. However, EGF and FGF decreased expression by 10%.
Conclusions
Starvation and overgrowth conditions increase PLSCR-1 expression while EGF, and FGF decrease it. This document PLSCR-1 expression usage as indicator for apoptosis and tissue loss.

Proliferative and Protective Effect of Oxytocin Against Cisplatin-Induced Neurotoxicity in PC12 Cell Line

Student(s) Name: *Ahmod A. Yoosuf*
Supervisor(s) Name: *Mohammed M. Alanazi*

Abstract:
Background
Cisplatin is an effective antineoplastic agent. However, neurotoxicity is one of its numerous dose-limiting adverse effects. The neuropeptide oxytocin (OXT), is a nonapeptide has been implicated in several vital physiological processes. Also, OXT has been shown to be associated with cell proliferation and protection against apoptosis, inflammation, and oxidative stress in many tissues, including brain. Effect of OXT on PC12 cells – a well-established model for studying neurons and neuronal differentiation, still need to be investigated. We hypothesized that OXT induces proliferation of PC12 cells and protects against cisplatin-induced neurotoxicity.
Methods
In proliferation experiments, cells treated with different concentrations of OXT every 48 hours for 120 hours. Then the proliferative effect evaluated by hemocytometer technique. The protective effect of OXT was evaluated by MTT assay. Cells either pretreated with OXT or with culture medium then exposed to cisplatin for 24 hours.
Results
In this study, we showed that OXT significantly induced cell proliferation in PC12 cells in a dose dependent manner at 120-hour time point. The viability studies showed that treatment of the PC12 cells with cisplatin for 24 hours significantly decreased viability levels compared to control group. On the other hand, pretreatment of PC12 cells for 24 hours with OXT before they exposed to cisplatin significantly blunted the reduction in viability levels compared to the group treated with cisplatin alone.
Conclusions
Our results indicate that OXT has a proliferative and protective effect against cisplatin-induced neurotoxicity in PC12 cells. These results will contribute to a better understanding of the physiological and therapeutic effects of OXT.

The Effect of Oxytocin on Human Melanocytes

Student(s) Name: *Abdulaziz M. AlSaeed*
Supervisor(s) Name: *Sary AlSanea, Mohammed M. Alanazi*

Abstract:

Background

Melanocytes are known for their role in skin pigmentation, and their ability to produce and distribute melanin has been studied extensively. Melanin is the pigment that gives human skin, hair, and eyes their color. Melanin is produced by cells called melanocytes. Oxytocin (OXT) is a hormone produced by the hypothalamus and secreted by the pituitary gland. Through oxytocin receptor, oxytocin significantly increased cell proliferation.

Methods

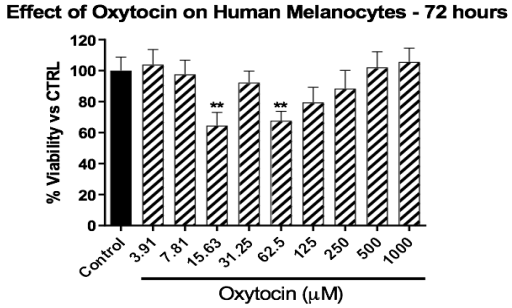
Started with growing melanocytes in the lab. Microscopy assay has been done after growing the cells to assure that we have adequate number of cells. After that Oxytocin has been applied to the grown cells by using different doses (3.91, 7.81, 15.63, 31.25, 62.5, 125, 250, 500 & 1000 µM). After applying the mentioned doses, cells have been incubated for 72 hours. Then MTT assay (By Microplate reader) has been conducted to analyze cell proliferation and viability.

Results

The relation between Oxytocin (in µM) and the viability rate of melanocytes. The effect of small doses of Oxytocin (3.91 & 7.81) was not affecting cell growth. But after using larger doses (15.63 & 62.5) a significant reduction in the proliferation was obtained (inhibition percentage of 42.87% and 50.26% respectively). Then rate of reduction reduced when larger doses were used (125, 250 & 500) until we reached almost no effect with the largest dose used (1000).

Conclusions

The results of our study reveal that Oxytocin has antiproliferation effect at specific doses on human melanocytes. Further studies are required to demonstrate other effects for oxytocin on human melanocytes.



The chemosensitization effect of verapamil on doxorubicin in TNBC cells

Student(s) Name: *Noura I. AL-Hadlaq, Noura A. AL-Buraidi*
Supervisor(s) Name: *Qamraa H. AL-Qahtani , Layla A.AL-Kharashi*

Abstract:

Background

Triple-negative breast tumors are very aggressive and resistant to chemotherapeutic drugs including doxorubicin. To overcome these limitations, we combined verapamil, a calcium channel blocker known to increase cancer cells sensitivity to anticancer agents, with doxorubicin to investigate the chemosensitization effect of verapamil on doxorubicin action against triple negative breast cancer cells (TNBC).

Method

The MDA-MB-231cell line was treated with combination of doxorubicin (0.4 µM) and verapamil at two doses (20, 40 µM). The viability of the cells was measured with MTT test in 48 and 72 hr intervals. Western blot (WB) technique was used to determine the expression of apoptotic proteins. RT-PCR was used to analyze the change in the expression of P-glycoprotein which plays role in doxorubicin nuclear uptake.

Results

We found that the combination of doxorubicin and verapamil at two different doses (20 and 40 mM) resulted in 43.4% and 45% reduction in cell viability, respectively ($p<0.001$). WB showed an elevation of the active caspase 3 (apoptotic protein) with the two verapamil doses. The combination of the two drugs did not show significant effect on the expression of P-glycoprotein.

Conclusions

These results indicate that doxorubicin/verapamil sequential combination could be of a great therapeutic value for TNBC patients through targeting the apoptotic pathway and the consequent chemosensitization effect. The addition of verapamil to doxorubicin can allow for the use of lower doses of doxorubicin to attain the same antitumor effect and probably lowers the side effects associated with doxorubicin therapy.

Drug delivery of miR-539-5p for treatment of Glioblastoma using dendrimer nanoparticles

Student(s) Name: *Rayan A.Nassani*

Supervisor(s) Name: *Norah A. Albekairi, Bahauddeen M. Alrfaei*

Abstract:

Background

Glioblastoma is the most frequently diagnosed malignant human glioma, and current median survival is less than two years despite maximal treatment. MicroRNAs have been demonstrated to be deregulated in different cancers. Functional analysis of miR-539 in glioma revealed that miR-539 expression was significantly decreased. However, miRNAs have difficulty penetrating through cell membranes and are vulnerable to degradation in the blood stream. Poly(amido-amine) (PAMAM) was a good carrier due to its high solubilization, delayed release and low toxicity.

Methods

Factorial study and characterization using Zetasizer were done on G4 PAMAM dendrimer, which internally quaternized with different degrees which calculated using NMR-spectrometry, then assembled with miRNA with different N/P ratios under fixed and variable conditions. The encapsulation efficiency and releasing of free miRNA under conditions resembling human cells were determined using RiboGreen assay. U87 human brain glioma cells were seeded in 96well-plate, then transfected with the miR-539-dendriplex to determine the transfection efficiency and thera¬peutic effects in in vitro using MTT assay.

Results

The average size of miR-539-dendriplex was 286.3 ± 14.57nm, and zeta potential of +26.6 ± 5.21mV. The encapsulation efficiency was 100% with N/P ratios higher than 25, and 90% of miR539 released within one hour. Treatment with dendrimer alone showed inhibition of 59%, 56% and 33%, while treatment with miR-359-dendriplex gave 85%, 70%, and 45%, both of which had concentrations equal to 5pmol, 10pmol, 20pmol, respectively.

Conclusions

We observed a dose dependent growth inhibition of glioma cells. The miR-539-dendriplex is beneficial for glioma therapy, which give synergistic effect.

Co-administration of ketamine and Fycompa shows therapeutic benefits in TBI mice model (behavioral and pathological studies)

Student(s) Name: *Azzam S.Alzogaibi*
Supervisor(s) Name: *Faleh Alqahtani*

Abstract:

Background

A recent rise in car accidents has increased traumatic brain injury (TBI) patients in Saudi Arabia. TBI causes a deficit in the nervous and motor system leading to disability. In this study, we evaluated the beneficial effects of the co-administration of ketamine with perampanel (Fycompa), preclinically in terms of pathological and behavioral readouts.

Methods

Forty-five male C57BL/6J black mice were divide in five groups- group A: TBI +Vehicle, group B: TBI + Ketamine, group C: TBI +Ketamine and Fycompa, group D: control + Vehicle and group E: control + Ketamine and Fycompa. All mice were anesthetized using isoflurane, the mice were exposed to TBI (group A, B and C) or returned to the cage (group D and E). Thirty minutes later, all mice received the treatment as per the study design. For behavioral (motor & cognition) readouts- open field, Y maze and Novel recognition objective tests were performed. Later, all mice were sacrificed, brains were collected and processed for histopathology examination using H&E staining of brain tissue.

Results

General activity of mice using total, distance travelled parameter were improved using ketamine or/and Ketamine and Fycompa (treated groups). In addition, the memory index showed improvement in the traded treated groups. Interestingly, post injury administration of ketamine or ketamine and Fycompa attenuated cell shrinkage and nuclear pyknosis (as observed in the histopathology slides).

Conclusions

We conclude that co-administration of ketamine with Fycompa shows beneficial effects after TBI in mice model, in terms of histopathology and behavioral tests.

Co-administration of ketamine and Fycompa reduces inflammation and brain tissue damage in TBI mice model

Student(s) Name: *Nawaf A. Alrsheed*
Supervisor(s) Name: *Faleh Alqahtani*

Abstract:

Background

A recent rise in car accidents has increased traumatic brain injury (TBI) patients in Saudi Arabia. TBI causes a deficit in the nervous and motor system leading to disability. In this study, we evaluated the beneficial effects of the co-administration of ketamine with perampanel (Fycompa), preclinically in terms of pathological and behavioral readouts.

Methods

Forty-five male C57BL/6J black mice were divide in five groups- group A: TBI +Vehicle, group B: TBI + Ketamine, group C: TBI +Ketamine and Fycompa, group D: control + Vehicle and group E: control + Ketamine and Fycompa. All mice were anesthetized using isoflurane, and exposed to TBI (group A, B and C) or returned to the cage (group D and E). Thirty minutes later, all mice received the treatment as per the study design. 24 hrs. after treatment, mice (n=3) were scarified. Blood and brain samples were collected. Plasma and brain samples were analyzed for NF-kB levels (using ELISA) and iNOS levels (using RT-PCR) respectively. H&E staining of brain tissue was also performed.

Results

Ketamine alone or ketamine and Fycompa co-treatment significantly decreased the enhanced levels of NF-κB (plasma) and iNos (brain tissue) in TBI mice (vs controls). This effect was not observed in ketamine treated TBI mice. Ketamine and Fycompa co-treatment further reduced damaged brain tissue, defined by a decrease in H&E staining intensity (histopathology slides).

Conclusions

We conclude that co-administration of ketamine with Fycompa shows beneficial effects after TBI in mice model, in terms of histopathology and inflammatory markers expression.

Pharmaceutical Engineering and Drug Regulation

Optimization of formulation variables for Gefitinib nanoparticles prepared by anti-solvent evaporation technique: Particle size and Zeta potential evaluation

Student(s) Name: *Gert N. Hoxha, Ahmed M. Kordi*
Supervisor(s) Name: *Mohamed A.Ibrahim*

Abstract:

Background

Gefitinib is an anticancer drug belonging to the tyrosine kinase inhibitors (TKI). Like many other antineoplastic agents, it shows poor solubility resulting in a low oral bioavailability. For this reason, nanoparticle formulations might provide a solution that can potentially overcome this problem.

Methods

The aim of the present work is to enhance Gefitinib dissolution rate and in turn, improve oral bioavailability and anticancer activity, by formulating the drug in nanosuspensions that will be stabilized by different concentrations of polyvinylpyrrolidone (PVP). The effect of formulation variables, viz., PVP concentration (X1) and stirring speed (X2) on the nanoparticle sizes and zeta potential values will be evaluated and optimized. Gefitinib nanosuspensions were prepared by solvent precipitation method.

Results

The experimental obtained data showed that increasing the stabilizer concentration significantly decreased the size of the formed nanoparticles ($p=0.0005$). On the other hand, an initial increase in stirring speed from 750 rpm to 975 rpm showed a pronounced decrease in particle size ($p= 0.0394$). Further increase of stirring speed did not significantly affect particle size. Regarding zeta potential, the independent formulation parameters showed a little impact on nanoparticle zeta potential, but these effects are insignificant ($p > 0.05$).

Conclusions

Stabilizer concentration and stirring speed were shown to have a significant impact on particle size and zeta potential of the formed Gefitinib nanoparticles.

Optimization of formulation variables on Gefitinib Nanoparticles Prepared by Anti-Solvent Evaporation Technique: In-Vitro and Cytotoxicity Evaluation

Student(s) Name: *Basel K. Alghamdi , Rayan A. Almutiri*
Supervisor(s) Name: *Gamal A. Shazly*

Abstract:

Background

Gefitinib (GEF) is a drug for the treatment of certain breast, lung and other cancers. GEF is an EGFR inhibitor, which interrupts signaling through the epidermal growth factor receptor (EGFR) in target cells.

Methods

In vitro release study was done for the prepared GEF formulations, which were prepared using different Polyvinyl Pyrrolidone (PVP) concentrations and different stirring rates. The purpose of this study was to study the effect of different PVP concentrations and different stirring rates on the in vitro release profiles of GEF.

Results

The in vitro release data obtained showed that increasing the stabilizer concentration significantly decreases the drug release. On the other hand, increasing the stirring speed did not affect the drug release.

Conclusions

Stabilizer concentration and stirring speed were shown to have a significant impact on in vitro release profiles GEF from the formed nanoparticles.

Design and evaluation of oral pharmaceutical dosage forms containing a novel antineoplastic agent

Student(s) Name: *Talal Alotaibi , Alyazid Aljohani*
Supervisor(s) Name: *Gamal M. Mahrous , Awwad A. Radwan*

Abstract:

Background

Cancer remains one of the most difficult health problems worldwide. Cell surface molecule CD44 plays a major role in regulation of cancer stem cells CSCs. The CD44 inhibitor compounds, N`-(2-oxoindolin-3-ylidene)-2-(benzyloxy) benzohydrazides (OYB) was recently reported by our group as anticancer agent. The oral route is regarded as the most widely preferred route of drug administration owing to its suitability, simplicity of administration, painless experience and adhered patient compliance. OYB is practically insoluble in water. The rate of absorption and/or the extent of bioavailability for such a poorly soluble drug are controlled by rate of dissolution. Hence, enhancement the solubility of OYB was done via solid dispersion (SD)technique.

Methods

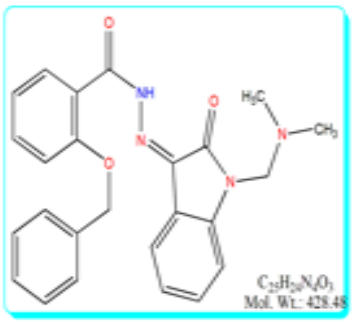
LogP was determined using shake flask method and the compound was assayed using UV spectrophotometer. Solid dispersion of OYB was prepared using (1:7) OYB: poloxamer 188 ratio by using kneading method. Tablets were prepared via direct compression and evaluated for physical properties and dissolution test. The anticancer activity of OYB solution and SD formulation were investigated in vitro.

Results

ClogP and XlogP were 2.63 and 2.29 respectively. Dissolution rate of solid dispersion was increased by 4 times fold compared with untreated drug. Also, IC50 decrease from 42 to 12 µgml-1 for untreated OYB and OYB SD respectively.

Conclusions

The solid dispersion of OYB showed enhancement in dissolution by about 4 folds and in cytotoxic activity by 3 folds for both powder and tablet dosage forms.



(Z)-2-(benzyloxy)-N'-(1-((dimethylamino)methyl)-2-oxoindolin-3-ylidene)benzohydrazide

Preparation and characterization of α-Santalol loaded nanocapsules with antimicrobial activity for biomedical applications

Student(s) Name: *Ahmed F. Mohammed*
Supervisor(s) Name: *Mohammed S.Alqahtani*

Abstract:

Background

This study aimed to obtain nanosystems utilizing lignin biopolymer to create bioactive nanocapsules. The biological activity of nanocapsules was demonstrated using amphiphilic natural polymer and antimicrobial essential oil as a combination system. α-Santalol has been shown to have in-vitro activity against Herpes simplex virus-1 & 2, as well as antimicrobial, astringent, antipyretic, anti-inflammatory activity. Due to lignin long hydrocarbon chains and phenolic heads with functional groups, this polymer was playing the role of carrier and surfactant-like substance facilitating the antimicrobial activity.

Methods

α-Santalol loaded nanocapsules were obtained by solvent anti-solvent technique. using a dispersion of nanocapsules in water. various analytical techniques were carried on examining their size, morphology, chemistry and antimicrobial activity. The mean particle size, size distribution and zeta-potential were determined using Malvern Zetasizer-S 3600. They were visualized by field emission-scanning electron microscopy (FE-SEM) at King Abdullah Institute for Nanotechnology (KAIN), KSU. The chemical characteristics were identified by X-Ray Diffractometer (XRD) to study the bonding to host polymer and the presence of α-Santalol. In vitro qualitative and quantitative assays utilizing model

pathogens (Gram +ve & -ve bacteria) and yeast to assess the antimicrobial activity.

Results and Conclusions

α-Santalol loaded nanocapsules found to be spherical and relatively uniform with sizes 120–200 nm. The oil encapsulated with high loading efficiency >90%. XRD spectra results revealed that α-Santalol has attached to the polymer. Biological evaluation revealed a synergistic antimicrobial effect against important opportunistic microorganisms with significant clinical relevance and could be utilized in future research for developing biomedical applications.

A novel drug delivery system for sustained release oral formulation utilizing nano emulsion: a pilot study

Student(s) Name: *Saud M. AlMutairi, AlWaleed M. AlJubairi*
Supervisor(s) Name: *Eihab Ibrahim*

Abstract:

Background

Lornoxicam is a poorly water-soluble NSAID according to the BCS system (class II) hence its dissolution is rate-limiting step for its absorption. Drug absorption from solid dosage forms after oral administration depends on dissolution. Because of the critical nature of this step, in vitro dissolution may be relevant to the prediction of in vivo performance.

Methods

Self-Nanoemulsifying Drug Delivery System (SNEDDS) were prepared by adding the exact compositions of each ingredient, mixing and then slightly heated in water bath to liquefy the components. Over 70 Formulations was prepared, tested and stored at ambient temperature in dark place overnight to predict any precipitation. Then every single formulation was tested for Visual Assessment Turbidity studies, Particle size analysis and In vitro dissolution studies. Then the best Formulation was chosen upon its properties.

Results

Dissolution profiles of Lornoxicam 8 mg tablet of Xefo® (without film) and 8 mg of Lonoxicam SNEDDS formula (F) are determined using USP2 rotating paddle apparatus (ERWEKA, DH-2000, Germany) maintained at 37 ºC ± 0.5 and a rotating speed of 50 rpm in a 900 ml of 0.1N HCL. Samples (5 ml) were withdrawn after 5, 10, 15, 20, 30, 45 and 60 minutes, filtered using a 0.45µm filters and assayed for LOX content using HPLC method.

Conclusions

The results obtained from this study revealed that by using the proper ratio and kind of surfactant and co-surfactant, LOX can be easily formulated into a SNEDDS with desired particle size range, turbidity and the amount of drug released. This could enhance drug absorption and decrease local effect of LOX on upper gut wall.

A smart liposome to trigger delivery of gefitinib to cancer cells

Student(s) Name: *Abdulmajeed T.Alfawzan, Mohammed S. Alshehri*
Supervisor(s) Name: *Mohammed Bdran*

Abstract:

Background

Non-small lung cancer (NSCLC) is one of the most mortal cancers and lacks effective treatment approach. Therapeutic efficiency can be enhanced through utilizing a smart delivery systems based on pH-sensitive liposomes (PSL) and cationic liposomes (CL) for tyrosine kinase inhibitor gefitinib (GFT). The present study was established to enhance tumor-targetability against human NSCLC and therapeutic effect.

Methods

Different liposomes were prepared as GFT-loaded PSL and CL with appropriate physiochemical properties based on particle size, entrapment efficiency (EE%), stability and release profiles. Moreover, anticancer activity was performed in vitro on human lung cancer cells using MTT assay.

Results

The mean particle size of the liposomes was less than 200 nm, and EE% was high in GFT-loaded PSL compared to GFT-loaded CL and conventional one (NL). Stability data showed that PSL, CL and NL were physically stable for 1 months at 4 oC. In vitro drug release study confirmed the sustained release of GFT at pH 7.4; while PSL exhibited rapid release of GFT drug release in pH 5.5. This effect revealed that PSL showed pH-sensitive release behaviors. In addition, the in vitro cytotoxicity study was performed for GFT-loaded PSL and CL due to best characterizations. Thus, in vitro anticancer activity revealed that PSL magnified the anti-tumor activity of GFT toward lung cancer cells. In addition, the inhibitory effect GFT-loaded CL was observed, indicating high anti-tumor activity of GFT-loaded PSL.

Conclusions

PSL might possibly produce practical clinical approaches for better targetability and delivery of GFT for treatment of lung cancer.

Formulation of Flufenamic acid nanolipid formulation: In vitro characterization and in vivo anti-inflammatory activity

Student(s) Name: *Abdulmalik A. Alyousef*
Supervisor(s) Name: *Sultan M. Alshehri*

Abstract:
Background
Flufenamic acid (FLF) is an aromatic amino acid consisting of anthranilic acid carrying an N(trifluoromethyl)phenyl substituent. It has analgesic, anti-inflammatory, antipyretic properties and further used in musculoskeletal and joint disorders and administered by mouth and topically. The aim of the present investigation was to develop a nanolipid formulation to enhance the solubility and therapeutic efficacy.
Methods
The developed FLF nano lipid formulations were evaluated for size, drug content, and encapsulation efficiency. The optimized formulation was characterized for DSC, electron microscopy, drug release and in-vivo anti-inflammatory activity on rat model.
Results
The optimized FLF nano lipid formulation showed the faster drug release as compared with the pure FLF. The prepared optimized FLF nano lipid formulation showed the particle size of 188 nm, entrapment efficiency (78.56 %) and higher drug release (95.34 %). There was a significant enhancement in drug release was achieved by nano lipid formulations as compared to pure FLF due to greater solubility of FLF in lipid.SEM analysis revealed the surface morphology of the nano lipid formulation. The anti-inflammatory activity results revealed significant reduction in the paw edema of the treated rat.
Conclusions
The overall results suggest a potential oral formulation with nano size, high drug encapsulation, improved drug dissolution, and enhanced therapeutic efficacy on rat.

Assembly of squalene decorated lipid nanoparticles as novel drug delivery for gefitinib to lung cancer cells

Student(s) Name: *Abdulaziz R. Alsaif, Naif F.Alamri*
Supervisor(s) Name: *Gamaleldin I. Harisa*

Abstract:
Background
The present study was conducted to enhance tumor-targetability gefitinib (GFT) into lung cancer cells through the development of squalene decorated lipid nanoparticles. The lipid nanoparticles (SLNs), nanostructured lipid carriers (NLCs), and nanoemulsions (NE) were proposed to achieve this goal. Such nanocarriers could be accumulated selectively into tumor cells through active targeting, and/ or effective retention and permeability effect (EPR).
Methods
Different nanocarriers of GFT-loaded SLNs and NLCs were prepared and squalene decorated using the nanoprecipitation method. Furthermore, the nanocarriers were characterized in terms of particle size, zeta potential, and morphology. Moreover, GFT entrapment efficiency (EE%), stability, and GFT release profiles were measured. In vitro cytotoxicity of the best formula was investigated using human lung cancer cells by MTT assay. Malvern particle size analyzer and spectrophotometric analyses were used in this study.
Results
In the present study, the mean particle size was less than 200 nm with negative zeta potential. EE% of GFT was higher in NLCs compared to other formulations. Stability studies showed that SLNs, NLCs, and NE were stable for 1 month at 4 oC. In vitro drug release study indicated that GFT loaded NCLs exhibited sustained release pattern in phosphate buffer saline at pH 7.4. The cytotoxicity studied revealed that NLCs augmented the cytotoxicity of GFT compared to GFT-loaded SLNs, NE, and free drugs.
Conclusions
Squalene decorated GFT-loaded lipid nanoparticles might be used as promising approaches for improving the targetability and treatment of lung cancer.

Development and Characterization of Dexamethasone-Loaded Polymeric Micelles for Enhanced Ocular Delivery

Student(s) Name: *Abdullah D. Alamri , Faisal K. Alhamdan*
Supervisor(s) Name: *Ziyad Binkhathlan, Musaed Alkholief*

Abstract:
Background
Corticosteroids, including dexamethasone, remain a mainstay for treatment of several inflammatory ocular diseases. Topical administration suffers from low ocular bioavailability owing to the rapid precorneal clearance and poor corneal permeability

of the drugs. The current solution to this delivery issue is through their local administration via implants and intravitreal injections, which are highly invasive and are associated with side effects and patient noncompliance. The main objective of this project was to develop a polymeric micellar formulation for topical administration of dexamethasone that can control the release of the drug and enhance its permeation through the cornea.

Methods

Methoxy poly(ethylene oxide)-block-poly(epsilon-caprolactone) (PEO-b-PCL) copolymers and D-alpha-tocopheryl polyethylene glycol 1000 succinate (TPGS) were used to prepare mixed micelles. Dexmethasone-loaded mixed micelles were prepared through a co-solvent evaporation method using acetone as the organic co-solvent. Prepared micelles were characterized for their mean diameters and polydispersity by dynamic light scattering. The encapsulation efficiency of dexamethasone as well as its in vitro release in simulated tear fluid were evaluated using a validated HPLC assay.

Results

The highest encapsulation efficiency of drug (41.5%) was achieved with PEO114-b-PCL114:TPGS mixed micelles (1:1 w/w). The mean diameter and polydispersity index of these micelles were 77.1 nm and 0.163, respectively. The in vitro release profile of dexamethasone from the developed formulation was significantly slower than the control formulation (f2 = 37%).

Conclusions

Our results points to a potential for PEO-b-PCL:TPGS mixed micelles as solubilizing vehicles for enhanced ocular delivery of dexamethasone. The assessment of ex vivo corneal permeation is underway.

The Efficiency of Disintegrant Nanonization in Enhancing the Dissolution Rate of Poorly Water-Soluble Drugs

Student(s) Name: *Lama F. Alzaidi, Alhanouf A. Altaleb, Bayan A. Alrashoud, Rahaf S. Aldawsari*
Supervisor(s) Name: *Doaa H. Alshora*

Abstract:

Background

Our current work aimed to study the effects of particle size reduction of Avicel®, which act as disintegrant on the dissolution rate of Rosuvastatin, a poorly water-soluble drug.

Methods

In this comparable study different particle size reduction methods were used, including probe sonication and dry milling technique by planetary ball mill. The effect of material load and time of sonication was studied in probe sonication method, while in dry milling the effect of speed was studied. The particles were then evaluated for particle size. Tablets containing rosuvastatin and Avicel® with smallest particle size obtained from each method were compressed by direct compression technique and evaluated for content uniformity, disintegration time and in-vitro dissolution rate,

Results

The results showed that probe sonication method produce smaller particle size of Avicel® (1357.4 ± 44. 5 nm) than that of dry milling 280 µm (vol. weighted mean).The in-vitro dissolution study showed that tablets prepared with F10 has a higher dissolution rate compared to F2 and control tablets ($P < 0.05$), while tablets prepared with F2 has low dissolution rate compared with control tablets.

Conclusions

In a conclusion, this study showed that decreasing the particle size of disintegrant could enhance the dissolution rate of poorly water-soluble drugs. Moreover, the study also showed that not all particle size reduction methods are applicable to produce smaller particle size of excipients with the same properties. Methods are applicable to produce smaller particle size of excipients with the same properties.

A comparative in vitro dissolution of different brands of irbesartan tablets available in Saudi Arabian market

Student(s) Name: *Abdullah M. Alanazi*
Supervisor(s) Name: *Abdul Ahad, Yousef Bin Jardan*

Abstract:

Background

The main objective of the present study was to evaluate between two different generic products of irbesartan which are commercially available in the Saudi Arabian market in comparison with innovator product (Aprovel®, 300 mg tablets). All the marketed products were evaluated for in vitro dissolution test.

Methods

In vitro release testing of innovator, and generics was carried out as per the USP monograph in 0.1 N of hydrochloric acid dissolution medium (1000 mL) maintained at 37 C° and 50 rpm using Sotax automated dissolution system. The detection of drug was carried out at 244 nm using UV

spectrophotometer. The tests were performed according to pharmacopoeial specifications using Apparatus II (paddle method).

Results

Among all the investigated irbesartan products, Innovator Aprovel® and Arena, Irbetel, tablet showed 93.25 ± 0.77% and 90.42 ± 1.70%, 92.18 ± 3.49% drug release at 30 minutes respectively. All the investigated generic products (Arena and Irbetel) released more than 80% of the drug within 20 minutes. The in vitro drug release result shows, insignificant differences in dissolution behavior between the innovator and investigated generic products.

Conclusions

Based on the obtained results and in comparison with the originator product (Aprovel®), all the tested generic products (Arena and Irbetel) are assumed to be chemically and pharmaceutically equivalent. Products Arena and Irbetel can be used as generic substitutes for the originator product.

Comparative Dissolution Testing of Gliclazide Modified Release Tablets

Student(s) Name: *Nasser H. Alshahrani*
Supervisor(s) Name: *Mohd A. Alam, Fahad I. Al-Jenoobi*

Abstract:

Background

Comparative dissolution studies are performed to establish the similarity of generic products with brand. Dissolution studies of gliclazide-MR tablets were carried out and dissolution profiles of generics products (GPRT-1 and GPRT-2) were compared with brand product (BPRT), registered in Saudi Arabia.

Methods

Studies were performed using Sotax Off-line dissolution apparatus (USP apparatus-II). Dissolution parameters were as: Paddle speed 100 rpm, temperature 37 ± 0.5°C, 900 mL quality media (pH-7.4 phosphate-buffer). Samples were withdrawn at 2, 4, 8 and 12 hrs. Samples were analyzed at λmax 226 nm, using UV-spectrophotometer.

Results

Dissolution profiles of six tablets of each product were studied. Dissolution data reveals that release from BPRT at 2, 4, 8 and 12 hours was 21.74 ± 0.64%, 39.95 ± 1.40%, 80.68 ± 3.21% and 110.48 ± 3.28%; respectively. Release from GPRT-1 was 10.80 ± 1.03%, 16.87 ± 1.69%, 33.30 ± 4.31%, and 51.82 ± 6.57%; respectively. Release from GPRT-2 was 21.15 ± 0.90%, 35.10 ± 3.26%, 69.79 ± 9.90%, and 90.75 ± 8.83%; respectively. Similarity factor (f2) and difference factor (f1) for GPRT-1 were calculated as 24 and 55, respectively. The f2 and f1 for GPRT-2 were calculated as 51 and 14, respectively. Stage-2 (S-2) dissolution is recommended for GPRT2, since one unit failed the requirement of last point release at stage-1, by just margin.

Conclusions

BPRT has passed requirement of release at all recommended sampling points. GPRT-1 has failed the similarity test, by failing the requirements of release at mid and last time-points. GPRT-2 has passed similarity test.

Antibacterial Activity of chitosan nanoparticles against pathogenic Neisseria gonorrhea

Student(s) Name: *Hiba A. Alhabib, Raghad S. Alsaif*
Supervisor(s) Name: *Fulwah Y.Alqahtani*

Abstract:

Background

Emergence of Neisseria gonorrhoeae strains that are resistance to the most used antibiotics. This challenges the effectiveness of clinical treatment regimens necessitating the development of alternative antibiotics. Chitosan is biocompatible polymer known to has antimicrobial activity against wide range of microorganisms. Therefore, chitosan has drawn attention to be a potential candidate in the era of multi-drug resistance. This study aims to formulate chitosan nanoparticles (CNPs), characterize their physicochemical properties, and examine their antimicrobial activity against gonococci.

Methods

Ionic gelation method was used to prepare CNPs at three concentrations 1, 2.5 and 5 mg/mL. Then a characterization for their particle size (PZ), polydispersity index (PDI) and zeta potential (ZP) were performed. Morphology of NP was examined using TEM. The antimicrobial activity of CNPs were investigated against 13 of WHO Neisseria gonorrhoeae reference strains using broth dilution method. Cytotoxicity of CNPs and their effect in bacterial adhesion to HeLa cells were investigated.

Results

The average PZ and ZP of prepared NPs were increased when chitosan concentration increased from 1 to 5 mg/ml and found to be in the range from 193 to 530 nm, and 14 mV to 20 mV, respectively. TEM images revealed spherical NPs, and NPs

showed low PDI (≤ 0.27). The formed CNPs produced antibacterial activity against all gonococcal strains tested with minimum inhibitory concentration (MIC90) of 0.16 to 0.31 mg/ml. At MIC90, CNPs were not cytotoxic on HeLa cells and reduced bacterial adhesion to host cells.

Conclusions

The formulated CNPs have potential as antibacterial agent against gonococci.

Cyclosporine A loaded polymeric micelles for uveitis

Student(s) Name: *Nawaf A. Al-Qahtani*
Supervisor(s) Name: *Abdullah H. Al Omrani*

Abstract:

Background

This project was designed to develop cyclosporine A-loaded polymeric micelle (CsA-loaded PM).

Methods

Polymeric micelles (PMs) was made of new amphiphilic polymers TPGS-poly(ethylene oxide)-block-poly(ε-caprolactone) (TPGS-PEO-b-PCL) with different molecular weight. PMs (TPGS-PEO-b-PCL) were investigated to enhance aqueous solubility of a hydrophobic drug cyclosporine. CsA-loaded PMs were prepared using co-solvent evaporation method at solvent/water ratio of 1/6. This method was repeated by using the same weight of different polymers (TPGS-PEO-b-PCL) with different CsA concentrations.

Results

The particle size of the prepared CsA-loaded PMs varied according to the molecular size of the amphiphilic polymers. The particle size was increased when the molecular weight of the amphiphilic polymer is increased. The encapsulation efficiency (EE%) of the prepared systems was affected by the ratio of the hydrophilic part to the lipophilic part of the polymer. Almost 100% of CsA was encapsulated when amphiphilic polymer with 1:2 ratio of hydrophilic:lipophilic parts was used.

Conclusions

These results revealed the potential of TPGS-PEO-b-PCL polymeric micelles as nanoscopic drug carrier for CsA.

Others

Effect of antibiotics subinhibitory doses on Pseudomonas aeruginosa quorum sensing dependent virulence and its phenotype

Student(s) Name: *Norah A.Alrumikan, Renad A. Almebk*
Supervisor(s) Name: *Fadilah S. Aleanizy*

Abstract:

Background

Quorum sensing (QS) has involved in regulation of Pseudomonas aeruginosa virulence factors. QS which known as cell-cell communication, controlled by two main systems; LasI/LasR and RhlI/RhlR. High emergence of Antibiotics resistance, necessitated looking for new therapeutic approaches. Therefore, inhibition of QS system will hinder the pathogenicity of P.aeruginosa. It was recently demonstrated that at sub-minimal inhibitory concentrations (MIC), antipseudomonal antibiotics broadly affect the virulence mediators, raising the question of whether conventional antibiotics may have the potential to inhibit QS activity.

Methods

The effect of azithromycin, cefepime, meropenem and peiperacillin/tazobactam at sub-MIC's against the QS-dependent virulence factors tested in P.aeruginosa wild type and QS mutant strains in transcriptional regulator LasR, autoinducer synthesis protein LasI, transcriptional regulator RhlR, protease precursor LasA and double mutants of LasR/RhlR regulators.

Results

Δ LasA increased bacterial growth by 85% and 65% in peiperacillin/tazobactam and Azithromycin respectively, peiperacillin/tazobactam increased Pyocianin production by 59%. (P≤ 0.05). ΔRhlR increased bacterial growth by 63% and 73% in cefepime and peiperacillin/tazobactam respectively, Cefepime increased biofilm production by 211%. (P≤ 0.05). Δ LasR/RhlR increased bacterial growth by 10% and 20% in meropenem and azithromycin respectively, Azithromycin increase in Biofilm production by 90%. (P≤ 0.05)

Conclusions

QS plays a key role in the expression of virulence and interaction with host protection. The studied antibiotics can be used at sub-MICs in combination with other antipseudomonal therapies to reduce the virulence that P.aeruginosa produce as protection, where it can help to overcome bacterial resistance and reduce adverse effects from high doses.

The Impact of a Restricted Pregabalin Prescription Policy on Drug Utilization: An Observational Study

Student(s) Name: *Lama A.Alsalim, Lujain M.Almohimeed*
Supervisor(s) Name: *Hadeel A. Alkofide, Ahmed H. Aljedai, Hajer Y. Almudaiheem, Alya Q. Alruwaili, Dema A.Alissa*

Abstract:
Background
In 2018, the Saudi Food and Drug Authority (SFDA) reclassified pregabalin as a controlled substance. It is unclear whether this policy change has affected the use of pregabalin. This study aims to examine the trends in pregabalin prescriptions before and after the implementation of SFDA restriction. In addition, the co-prescription of other controlled analgesics, and the appropriateness of pregabalin prescriptions were evaluated.
Methods
A cross-sectional study on outpatient pregabalin prescriptions from three large healthcare centers in Saudi Arabia. Data was collected using electronic medical records, in which the following were extracted: pregabalin prescriptions, indication for use, and co-prescription of tramadol and acetaminophen with codeine. The year 2016-2017 was identified as the pre-restriction period, while 2018-2019 as the post-restriction period. Prescriptions were defined as appropriate if they were prescribed according to pregabalin approved indications. Descriptive statistics were used. Ethical approvals were obtained from each hospital.
Results
In this study 38,756 prescriptions of pregabalin were identified. In the pre-restriction period, there were 8,631 subjects on pregabalin with 16,768 prescriptions, compared with 6,960 subjects and 21,988 prescriptions post-restriction. The number of co-prescriptions of tramadol or acetaminophen with codeine in subjects using pregabalin has increased in the post-restriction period by 540%, and 190%; respectively. Only 3.2% of pregabalin prescriptions were used for approved indications.
Conclusions
There was a trend toward reduction of pregabalin use after implementing SFDA-enforced prescribing restriction. This was accompanied with increased utilization of narcotics in the post-implementation phase. Further analysis of the reasons behind prescribing reduction of pregabalin is warranted.

Evaluation of the GABAergic Neuronal System in the BTBR Autistic Mouse Model

Student(s) Name: *Abdurahman K. Alzeer, Abdulaziz Mahdi*
Supervisor(s) Name: *Musaad A. Alshammari*

Abstract:
Background
Autism spectrum disorder (ASD) is a complex neurodevelopmental disease characterized by deficits in social communication, stereotyped behaviors, and limited interest. Numerous factors have been linked to the pathology of ASD. Until now, a complete understanding of the molecular elements that lie at the basis of ASD has remained elusive. The GABAergic inhibitory interneurons comprise a small group of the neuronal population. However, they exert powerful and tight control over the neuronal activity. Growing evidence indicates that disruption of inhibitory interneurons are linked to the etiology of multiple neurodevelopmental and psychiatric disorders, including ASD. Here, we examined the integrity and protein expression of the inhibitory interneurons in the BTBR T+ Itpr3tf/J autistic mouse model, a model that exhibits behavioral, electrical, and molecular features of autism, compared to the C57/B6 wild-type control mouse.
Methods
In this study, we employed powerful approaches, including transgenic animal model, western blot, immunohistochemistry of different inhibitory interneurons markers, high-resolution confocal microscopy, and Image analysis.
Results
Our data suggest a disruption of the expression of parvalbumin and calbindin inhibitory interneurons in the BTBR compared to the control mice. Immunofluorescence examinations indicated that the fluorescence intensity of parvalbumin is significantly reduced in the cerebellum, a brain region implicated to the motor dysfunction of BTBR mice compared to the control mice. However, the fluorescence intensity of calbindin was increased dramatically, suggesting a possible compensatory mechanism occurs at the inhibitory interneurons.
Conclusions
Our results may provide evidence of previously undescribed mechanisms that play a role in the pathogenesis of ASD.

Hemocompatible novel imines compounds possessing

Student(s) Name: *Abdulmalik Alnami*
Supervisor(s) Name: *Mohammad A. Altamimi , Sultan Alshehri , Afzal Hussain , Ahmed Bari*

Abstract:
Background
Typically, imine refer to compounds having carbon-nitrogen double bond. Imines, which are also called schiffs base are the versatile synthetic intermediates for the synthesis of various natural products and synthetic analogues. Several imines have been well established for therapeutic (anticancer, antimicrobial) and non-therapeutic applications (dyes and catalysts).They are also used as ligands in coordination chemistry.
Methods
In the present study, novel imine compounds (AM-3, AM-5, AM-7 and AM-8) were synthesized, characterized and evaluated for potential activity against bacterial, fungal and Mycobacterial strains. These were characterized for physicochemical properties using NMR, FTIR, DSC, XRD, and subsequently solubility in various solvents, surfactants and co-surfactants. Hemocompatibility assessment ensured safety of the developed imines at explored concentration using rat erythrocytes.
Results
All compounds were insoluble in water and crystalline in nature as reported in DSC, XRD and SEM (scanning electron microscopy) studies. Moreover, in vitro antimicrobial assay results exhibited that AM-7 and AM-5 compounds were more detrimental (minimum inhibitory concentration) against A. baumannii, whereas AM-3, AM-5 and AM-8 were more effective against Candida albicans. Furthermore, all and AM-3 as well as AM-7 elicited ZOI against S. aureus (ZOI ~ 12.75 mm) and Mycobacterium (ZOI ~ 20 mm), respectively
Conclusions
The potential imine compounds could be a challenging lead to control fungal, bacterial and mycobacterial infection.

FEASIBILITY AND ACCEPTABILITY OF WEB-BASED PATIENTS REPORTED OUTCOME APPLICATION IN CANCER PATIENTS DURING CHEMOTHERAPY

Student(s) Name: *Nibras A. Alhazmi, Amjad Abdu Alsharif*
Supervisor(s) Name: *Lamya S. Alnaim*

Abstract:
Background
Adverse effects (AE) of chemotherapy are frequent in cancer patients. Nausea, vomiting, diarrhea, and fatigue are the most common AE of chemotherapy. Usually undetected by a health care provider. This may lead to further complications that alter the patient's adherence. Using electronic Patient-Reported Outcomes (ePRO) may eliminate the limitations in the standard PRO and improve overall cancer patients' care by increasing the reporting rate. Furthermore, immediate management of these AE with adequate monitoring provided to patients will result in improvement of the quality of life. This study aimed to assess the feasibility and acceptability of web-based PRO measures in cancer patients during chemotherapy.
Methods
A prospective feasibility study performed in cancer patient's undergoing chemotherapy. We designed, and tested CPRO through 3 phases:

- Phase 0: Developed the questionnaire. Parallelly, in collaboration with Website Developer, Web-based patient-reported outcome application was built.
- Phase 1: Assessed the validity and accessibility.
- Phase 2: Enrolled patients provided with informed consent and instructed on how to use the web-based application and how they can report their AE at any time.

Results
Out of 70 eligible patients were approached, 36 accepted to participate. 20 registered to CPRO, 17 filled the questionnaire who have a higher education level, have been diagnosed within a year, and with a variety of cancer types colon and breast cancer were the most.
Conclusions
Although this study shows low feasibility but high acceptability for the ePRO, the findings of the study may provide useful insight to improve ePRO to more usable and acceptable system.

The Cost Effectiveness of Different Antihypertensive Monotherapy in the Management of Elevated Systolic Hypertension: A Single Center Retrospective Chart Review Study

Student(s) Name: *Abdulaziz AlSaigh, Khalid Almalki*
Supervisor(s) Name: *Yazed AlRuthia, Wael Mansy*

Abstract:
Background
In Saudi Arabia, the prevalence of essential hypertension is believed to range from 3.2% among those under 24 years of age to 70% among those who 65 years and above, however, the cost effectiveness of different antihypertensive

medications in combination or monotherapy has not been examined. Therefore, the aim of this study was to examine the cost effectiveness of different antihypertensive monotherapy in the management of essential hypertension using real world data in Saudi Arabia.

Methods

This was a retrospective cohort study in which adult patients (≥18 yrs.) with essential hypertension on a single antihypertensive medication and without malignancies or cardiovascular disease with complete data for 12-18 months were recruited from the electronic health records of a university-affiliated tertiary care center in Riyadh, Saudi Arabia. The mean public acquisition cost per 1mmHG reduction in systolic blood pressure was estimated.

Results

The number of patients were met the inclusion criteria and were included in the analysis was 153. There were 111 patients on angiotensin converting enzyme inhibitors (ACEIs) or angiotensin receptor blockers (ARBs), and 44 patients on amlodipine. The Incremental Cost Effectiveness Ratio (ICER) of amlodipine group versus ACEIs &ARB group was SAR 76.67. The use of ACEIs or ARBs would result in lower cost and better outcome 55.26% of the time and lower cost and outcome in 44.74% of the time.

Conclusions

The use of ACEIs or ARBs monotherapy seems to be more cost effective as monotherapy compared to amlodipine in the management of elevated systolic hypertension.

Economic Burden of Osteoporosis Related Fractures in Saudi Arabia

Student(s) Name: *Bader M. Alotaibi, Sulaiman T. Alqusair*
Supervisor(s) Name: *Bander Balkhi*

Abstract:

Background

Osteoporosis and its complications are a major concern in Saudi Arabia and the prevalence of osteoporosis is on the rise due to increased life expectancy. This calls for an assessment of the economic burden of the disease in Saudi Arabia. The objective was to estimate the total cost of the burden of all types of fractures in a patient with osteoporosis.

Methods

A retrospective study among adult patients with osteoporosis. All healthcare resources used during the study period were quantified. A bottom-up approach was conducted to estimate the healthcare resources use and to calculate the total direct medical cost for the treatment of osteoporosis and related fracture. The unit of analysis was the average cost per patient per year.

Results

The study included a total of 511 osteoporosis patient (59 with fracture), 93% were female. The average (SD) age was 68.5 (10.2). Total mean direct medical costs for non-fracture were SAR 2,444.96 per person per year (PPPY) and for osteoporotic fracture the total direct cost were SAR 44,626.60 PPPY of which 56% was attributable to surgery procedures. Prior to fracture the main cost components were medication which represented 57% and diagnostic imaging (27%).

Conclusions

Finding of this study indicate the economic impact of osteoporosis and related fracture. As of growing aging population in Saudi Arabia, the burden of disease could increase significantly, which highlight the need for effective prevention strategies to minimize the economic burden of osteoporosis.

Preparatory Year Students' Perception of Pharmacy as a Career: A Cross-Sectional Study

Student(s) Name: *Abdulrahman Almohydib, Fahad Alharbi*
Supervisor(s) Name: *Fowad Khurshid , Abdaltif Alghaiheb*

Abstract:

Background

The aim of the study was to evaluate preparatory year students' perceptions towards the pharmacy profession as a future career.

Methods

This was a cross-sectional survey study that was conducted between 01-29 February 2020. Google Forms®, an online survey platform was selected to administer the survey questionnaire. Preparatory year students of health colleges through the Saudi universities were invited to complete an anonymous on-line questionnaire.

Results

A total of 244 preparatory year students of health colleges participated in the study. The majority (53.7 %) were female and the mean age was 19.2 ± 0.65 years. Regarding students' perceptions towards pharmacists and the pharmacy profession, the majority (91.8%) agreed that pharmacy is a well-respected profession, and pharmacists make life-saving decisions (82.4%). Regarding the pharmacy profession, the majority of the participants (95.5%) agreed that pharmacists must have a university degree to practice pharmacy, 88.6% agreed pharmacists have to take responsibility for the people they take care of and 82.8% believed that pharmacists have to work too hard. Regarding the choice of future profession, about 48.8% of students

show confidence in choosing pharmacy as a future career profession.

Conclusions

There is a willingness among preparatory year students to choose pharmacy as a career. General perception regarding profession is that pharmacy is a well-respected profession within the community which needs skills, practice, and hardworking pharmacist become a member within patients life-saving team.

Estimating Resources Utilization and Health Care Costs Related to Colorectal Cancer Patients in Saudi Arabia

Student(s) Name: *Marwan T. Al Najjar, Abdullah K.Al Harbi.*
Supervisor(s) Name: *Bander Balkhi, Saeed AL Qahtani*

Abstract:

Background

The prevalence of colorectal cancer (CRC) is rising globally; colorectal cancer is the second most common cancer among Saudi population and has increased in last two decades. This study aimed to estimate the burden of colorectal cancer considering, demographics, stage, site, and cost.

Methods

A retrospective single-centered cohort study of all CRC patient from January 2016 to December 2019, all patient's information was extracted from Electronic Health Records of King Khalid University Hospital. The study included all management cost of CRC in patients above 18 years old and excluded patients with missing information.

Results

A total of 326 colorectal patients were eligible for this study. Around two thirds of the cases were male and most of the patient 89% were Saudi. The average age for men was 59.2 and for women was 55.27. The total direct medical costs for all colorectal cancer patients was SAR 118 million. The annual cost per patients were SAR 363,003.37. The costs related to medication were the major driver healthcare spending among all study population (45%) followed by surgery costs (27%). Cost were considerably increase as stage increase were the cost per patient for stage 1 was SAR 190,230 and it is increase to over SAR 350,000 in stage 4.

Conclusions

This study presented various cost details for colorectal cancer which represent a substantial cost to Saudi healthcare budget and this cost is expected to increase significantly in the future because of expected growth and aging of the population and availability of costly treatment.

Examining the Cost Effectiveness of Biologic versus Non-Biologic Therapy regimens in Improving Inflammatory Bowel Disease Patients' Health-Related Quality of Life

Student(s) Name: *Hala H. Alrasheed, Wejdan R. Alsharif, Ghada S. Almuaythir*
Supervisor(s) Name: *Yazed S. AlRuthia*

Abstract:

Background

Ulcerative Colitis (UC) and Crohn's Disease (CD) are two debilitating Inflammatory Bowel Diseases (IBD). Biologic agents have proven to be effective in improving the IBD patients' health-related quality of life (HRQoL) but at a significantly higher cost compared to non-biologics. Therefore, the aim of this study was to examine the cost effectiveness of biologic versus non-biologic therapy regimens among a sample of patients with IBD in Saudi Arabia.

Methods

This was a retrospective cohort chart review study in which adult IBD patients (≥18 yrs.) with no malignancies were recruited. A cohort of IBD patients who were started on biologic therapy regimen was compared to another cohort on non-biologic therapy regimen with regard to utilization cost and the EQ-5D-3L VAS scores at baseline and 6-month later. Sensitivity analysis was conducted using propensity score bin bootstrapping (PSBB) with 10,000 replications.

Results

The number of patients who met the inclusion criteria was156 patients in which about 52% of them were females, and their mean age was 38 years. The percentages of patients with CD and UC were 56% and 44%, respectively. More than one third of the patients were on biologics (38%). The mean cost difference between biologic and non-biologic therapy regimens was $6850.79 (95% CI: 6546.28-7324.03). On the other hand, the mean difference in EQ-5D-3L VAS score was 4.78 (95% CI: 1.96-14.00).

Conclusions

The findings of this study suggest that biologic therapy regimens in the management of IBD result in modest improvement in patients' HRQoL with a significant incremental cost.

Pharmacovigilance in healthcare education: students' knowledge, attitude and perception: A Cross-sectional study in Saudi Arabia

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Supervisor(s) Name: *Monira Alwhaibi, Noha alaloola, Tariq alhawassi*

Abstract:

Background

Medication safety and pharmacovigilance (PV) remains as an important discipline worldwide. However, there is a significant lack of knowledge of PV and adverse drug reaction reporting (ADR) among students in the healthcare field. Thus, this study aimed to measure knowledge, attitude, and perceptions and compares it between healthcare students (i.e., medicine, dentistry, and nursing).

Methods

A cross-sectional study involving 710 undergraduate healthcare students from different universities in Saudi Arabia was conducted. A validated structured pilot-tested questionnaire was administered to the participants assessing their knowledge, attitude, and perceptions towards PV and ADRs reporting. Descriptive statistics were used to describe the study findings. Data was analyzed using SPSS version 21.

Results

Findings showed that 60.8% and 40.0% of healthcare students correctly defined PV and ADRs respectively. Most students showed positive attitudes and perceptions towards PV and ADRs reporting. PV knowledge, attitude, and perceptions towards PV were significantly higher among pharmacy students as compared to other healthcare students. Only 39% of healthcare students revealed that they have received any form of PV education and 49% indicated that PV is well covered in their school curriculum. Pharmacy students are more trained in their schools to report and have performed ADRs reporting in their school as compared to other healthcare students.

Conclusions

Pharmacy students have better knowledge, attitude and perception of PV and ADR reporting in comparison to other healthcare students. The study clearly describes the need for integrating pharmacovigilance education in Saudi healthcare schools' curriculums to prepare them for real-world practices and workplace.

Antimicrobial Susceptibility Patterns and Detection of Carbapenemases Among Carbapenem Insensitive Pseudomonas aeruginosa Isolates

Student(s) Name: *Yassir H. Adam, Abdelrahman Y. Ibrahem, Abdulaziz N. AlQahtani*

Supervisor(s) Name: *Mohammed H. AlAgamy, Altaf Khan, Mohammed R. Alhuzani*

Abstract:

Background

Pseudomonas aeruginosa is an opportunistic nosocomial pathogen and common in hospital acquired infections. Carbapenem is the drug of choice for treatment of P. aeruginosa, which possesses diverse resistance mechanisms to carbapenem. Therefore, this study is aimed to determine the antimicrobial resistance pattern and to investigate the main resistance mechanism to carbapenems.

Methods

A total of 100 clinical isolates of P. aeruginosa were kindly provided from College of Pharmacy Research Center. These isolates were tested for antimicrobial susceptibility testing by disc diffusion method using a panel of antibiotics including carbapenems. Minimum Inhibitory concentrations (MICs) were done by E test strips. Carbapenemases were screened phenotypically by Modified Hodge Test (MHT). Metallo Beta-lactamases (MBL) were phenotypically detected by Combined Disk Synergy Test using EDTA as MBL inhibitors.

Results

Thirty-six (36%) out of 100P. aeruginosa isolates were resistant to imipenem. The resistant isolates showed imipenem inhibition zone ≤27mm. The resistance rates for β-lactams including cefuroxime, cefoperazone, ceftazidime, aztreonam, and piperacillin/tazobactam were 87.7%, 80.3%, 60.6%, 45.1%, and 25.4%, respectively. The resistant rates for non-β-lactams including gentamicin, ciprofloxacin, and amikacin were 50%, 43.4%, and 32.8%, respectively.

Conclusions

The resistance rate to the most antibiotics was very high. High prevalence of Carbapenem resistant P. aeruginosa isolates in the present study. The resistance rates of all antimicrobial agents were higher for Carbapenemase-producing than non-Carbapenemase-producing P. aeruginosa isolates. The most dominant Carbapenemase was MBL.