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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНИТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman** (**Кириллица**), для текста на грузинском языке следует использовать **AcadNusx.** Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - http://www.spinesurgery.ru/files/publish.pdf и http://www.nlm.nih.gov/bsd/uniform_requirements.html
В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректура авторам не высылается, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or compu-ter-printed on a single side of standard typing paper, with the left margin of **3** centimeters width, and **1.5** spacing between the lines, typeface - **Times New Roman** (**Cyrillic**), print size - **12** (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf
In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

Articles that Fail to Meet the Aforementioned Requirements are not Assigned to be Reviewed.

ავტორთა საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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EVALUATION OF PAIN-KILLING ACTION OF ACETYLSALICYLIC ACID NANOPARTICLES ON THERMAL NOCICEPTION IN MICE

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Abstract.

Pain is a common experience that can range from mild annoyance to debilitating agony. As such, finding effective ways to relieve pain is a crucial aspect of healthcare. Aspirin, a nonsteroidal anti-inflammatory drug (NSAID), is a commonly used analgesic that works by inhibiting the production of prostaglandins, which are responsible for causing pain. However, the effectiveness of aspirin can be influenced by various factors, including the form in which it is administered. The current study aimed to compare the effects of aspirin's ordinary particles and nanoparticles as an analgesic utilizing the hot plate method in topical formulations (gel, ointment, cream). The study employed 120 albino mice, all males, divided into six groups. In the three groups, aspirin was topically applied using various formulations (gel, cream, and ointment, respectively) and concentrations (0.25, 0.5, and 1%). The same composition and concentration of aspirin nanoparticles were administered to the other three groups. The reaction time was assessed after aspirin was topically applied at 2, 10, 20, 30, 40, 50, and 60-minute intervals. Extended delay durations in comparison to control values were used to express the ant-nociceptive effects of aspirin. The results of the study showed that aspirin nanoparticles produced the best analgesic impact, followed by the cream and then the ointment, according to the data. This suggests that the form in which aspirin is administered can significantly influence its effectiveness as an analgesic. The use of nanoparticles may increase the bioavailability of aspirin, allowing it to be more efficiently absorbed by the body and produce a more significant analgesic effect. Overall, the study's findings suggest that aspirin nanoparticles may be a more effective form of aspirin for pain relief than ordinary particles. Further research is needed to explore the potential benefits and drawbacks of this form of aspirin and determine its efficacy in human subjects. Nevertheless, the current study provides valuable insights into the factors that can influence the effectiveness of aspirin as an analgesic and may inform future developments in pain management.

Key words. Ordinary aspirin, aspirin nanoparticles, analgesia.

Introduction.

Non-steroidal anti-inflammatory medicines, or NSAIDs, are a commonly used class of drugs used to treat a variety of conditions. They are often used to alleviate pain, reduce fever, and decrease inflammation in patients suffering from a range of diseases. NSAIDs work by blocking the production of certain chemicals in the body that are responsible for pain, fever, and inflammation. This can be a very effective way to manage symptoms and improve the quality of life for patients [1,2].

Aspirin is the most popular NSAID. One billion pills are taken every year since its discovery more than a century ago [3]. Similar to other NSAIDs, aspirin also blocks the production of prostaglandins by the enzyme cyclooxygenase (COX) [4]. Aspirin permanently inhibits the catalytic and constitutive COX enzymes COX-1 and COX-2, which are responsible for increasing the production of prostaglandin E2 from arachidonic acid [5]. Aspirin has a brief half-life in circulation (20 minutes), and it is quickly deacetylated and converted to salicylate in living tissue.

The activity of COX-1 or COX-2 is unaffected by salicylates. As a result, the anti-inflammatory and anti-cancer effects of aspirin and salicylates are still up for debate [6]. Additionally, the antiviral activities of ASA against RNA and DNA viruses have been linked. When a lysine salt formulation of ASA (d, l-lysine acetylsalicylate) was utilized, one of the side effects was the reduction of RNA replication and production of MERS-CoV and human CoV-229E titers in infected cells culture [7].

Nanoparticles (NPS), which range in size from 1 to 100 nm, have been created as cutting-edge, distinctive, and focused medicinal and diagnostic agents. Bioengineers can modify their fundamental properties, such as improved solubility, increased ability to diffuse and hydrolyze, reduced immunogenicity, and improved therapeutic indication, to overcome the difficulties associated with the use of conventional mode. Their unique physical and chemical properties, such as their large surface area for mass, bulk, or volume, and significantly small volume [8,9].

This study aims to evaluate the analgesic effects of several topical aspirin administration techniques, including gel, cream, and ointment, in the same formulation as the nanoparticle formulation.

Materials and methods.

The animals: In the current study, a total of 120 male albino mice (weighing between 30-35 grams) were used. They were housed in standard acceptable conditions (plastic cages, temperature of 22°C, standard food/drinks, and a 12-hour dark/light cycle) approved by Animal Care House at the University of Mosul in Iraq.

Preparation of aspirin in pharmaceutical forms: The raw materials used for this study were sourced from commercial suppliers, ensuring the highest quality analytical grade ingredients for research preparation. To create varying concentrations of aspirin, 0.25, 0.5, and 1g, of active ingredients were added into 100 g of formulation, stirring the mixture to confirm homogeneity and contact uniformity, and then an innovative attrition method was used to prepare aspirin nanoparticles.

Experiment design: The purpose of this study was to investigate the effects of different topically applied concentrations of normal versus nano aspirin on pain inhibition in mice. The animals (120 mice) were divided into six major groups, each with 20 animals. Within each major group, the animals were further divided into four subgroups, with each subgroup containing

five mice. The first subgroup in each major group served as the control group, while the remaining subgroups received different topically applied concentrations of normal or nano-aspirin, at concentrations of 0.25% 0.5%, and 1%. The first group received topically applied doses of ordinary aspirin gel, while the second group received doses of an aspirin gel for nanoparticles. The third group received doses of aspirin cream, while the fourth group received doses of aspirin cream for nanoparticles. The fifth group received doses of aspirin ointment, and the sixth group received doses of aspirin nanoparticles with varying concentrations.

The researchers experimented to test the effectiveness of aspirin in various forms (gel, cream, ointment, and nanoparticles) at different concentrations (control, 0.25%, 0.5%, and 1%) on mice's front and hind paws. To induce pain, we placed the animals on a hot plate with a constant temperature of 55°C and recorded the reaction time, which is how long it took for the mice to start licking or grasping their paws. The hot plate was steeped for 30 seconds to prevent any thermal damage to the paws. This method helped the researchers measure the intensity of pain stimuli. The results of the experiment would be crucial in determining the most effective way to administer aspirin to alleviate pain.

To understand how different animals react to pain, we recorded the time it took for them to react under normal conditions. This served as a baseline for further experiments. Using a topical formula, we then tested their reaction times after applying various concentrations of medication at different time intervals (A at 2 min., B at 10 min., C at 20 min., D at 30 min., E at 40 min., F at 50 min., and finally G at 60 min.). This gave valuable insights into the efficacy of the medication in different dosages. By comparing the reaction times to a matching control value, we were able to gauge the aspirin's antagonistic impact. With numerous administrations and concentrations, our findings shed light on the complex relationship between pain, medication, and animal behaviour.

Statistical analysis: A chi-square test was conducted to highlight the differences between groups. To ensure statistical significance, we set the level at p 0.05 for a one-way analysis of variance across the three experimental groups.

Results.

The application of normal aspirin gel formula in various concentrations (0.25%, 0.5%, and 1%) for relieving pain in comparison to the control group considering different application intervals. The results indicated that the usual formulation produced a slight pain-relieving effect compared to the control group at different intervals (A to G), with better response at 0.5%, and 1% compared to 0.25% (Figure 1i). While analgesic effects of topical application of aspirin nanoparticles in gel form at concentrations of 0.25%, 0.5%, and 1% (Figure 1ii) were compared to a comparable control group. Normal gel preparation achieved a nearly similar response compared to nanoparticle-prepared gel, the effects are much better with higher concentrations of normal and nanoparticle gel (0.5%<1%) achieving optimum effects at F (50 min.) and with 1% concentration (Figure 1i).

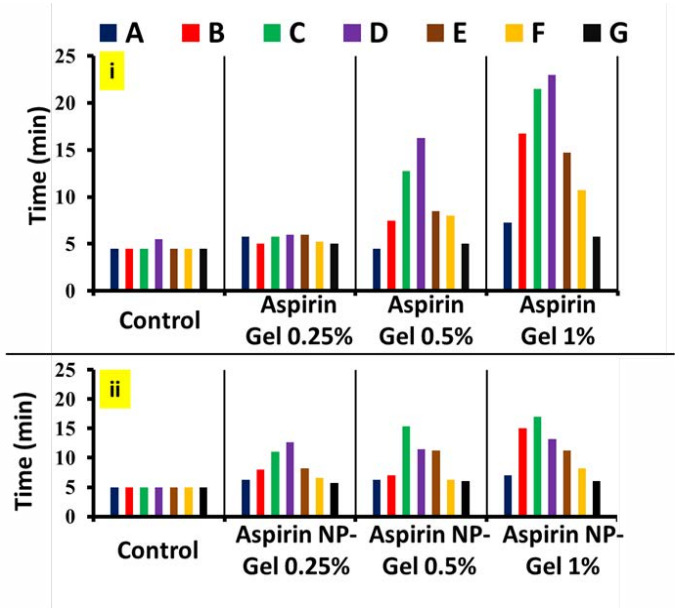

Figure 1. *Period records are required to elicit pain stimuli in tested animals using aspirin gel at different doses and dosages. (i) ordinary gel, (ii) Nanogel particles. The time interval for application of medication is represented as A at 2 min., B at 10 min., C at 20 min., D at 30 min., E at 40 min., F at 50 min., and finally G at 60 min.*

The application of normal aspirin cream formula in various concentrations (0.25%, 0.5%, and 1%) in relieving pain in comparison to the control group considering different application intervals. The results indicated that the usual formulation produced a slight pain-relieving effect compared to the control group at different intervals (A to G), with better response at 0.5%, and 1% compared to 0.25% (Figure 2i). While analgesic effects of topical application of aspirin nanoparticles in the cream form at concentrations of 0.25%, 0.5%, and 1% were compared to a comparable control group. A better response was achieved compared to the control group and normal cream, the effects are much better with higher concentration (0.5%<1%) achieving optimum effects at E (40 min.) and with 1% ointment nanoparticles (Figure 2ii).

The application of normal aspirin ointment formula in various concentrations (0.25%, 0.5%, and 1%) in relieving pain in comparison to the control group considering different application intervals. The results indicated that the usual formulation produced a slight pain-relieving effect compared to the control group at different intervals (A to G), with better response at 0.5%, and 1% compared to 0.25% (Figure 3i). While analgesic effects of topical application of aspirin nanoparticles in ointment form at concentrations of 0.25%, 0.5%, and 1% were compared to a comparable control group. A better response was achieved compared to the control group and normal ointment, the effects are much better with higher concentration (0.5%<1%) achieving optimum effects at E (40 min.) and with 1% ointment nanoparticles (Figure 3ii).

This study conducted a comparison of the analgesic effect of three different normal 1% formulations, namely gel, cream, and ointment. The results showed that the gel formulation exhibited the best analgesic effect among the three. It was followed by

cream and then ointment. The comparison was made over 20 minutes, during which the analgesic effects of the three formulations were measured. This study is significant in the field of medicine and pharmaceuticals, as it provides valuable information on the efficacy of different formulations in treating pain. The gel formulation, which was found to be the most effective, can potentially be used as a preferred option in pain management (Figure 4).

Discussion.

In this study, it was found that the use of nanostructured aspirin preparation particles resulted in a significantly improved response compared to the traditional formulation. Simply

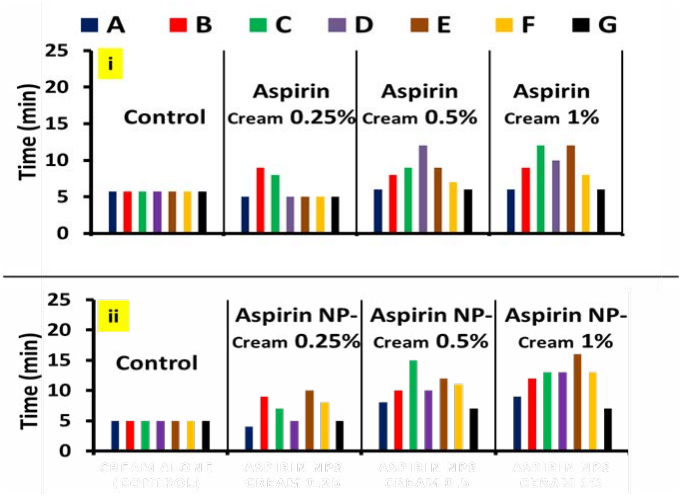

Figure 2. *Period records are required to elicit pain stimuli in tested animals using aspirin cream at different doses and dosages. (i) ordinary cream, (ii) Nanocream particles. The time interval for application of medication is represented as A at 2 min., B at 10 min., C at 20 min., D at 30 min., E at 40 min., F at 50 min., and finally G at 60 min.*

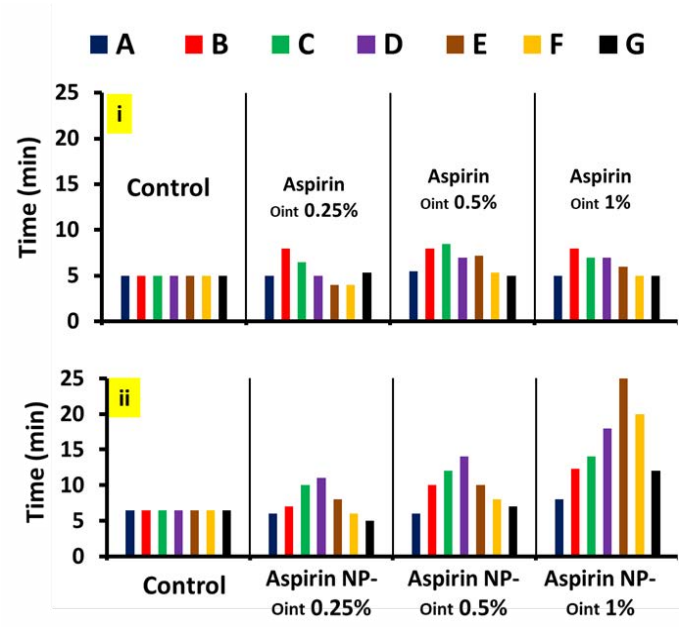

Figure 3. *Period records are required to elicit pain stimuli in tested animals using aspirin ointment at different doses and dosages. (i) ordinary ointment, (ii) Nano-ointment particles.*

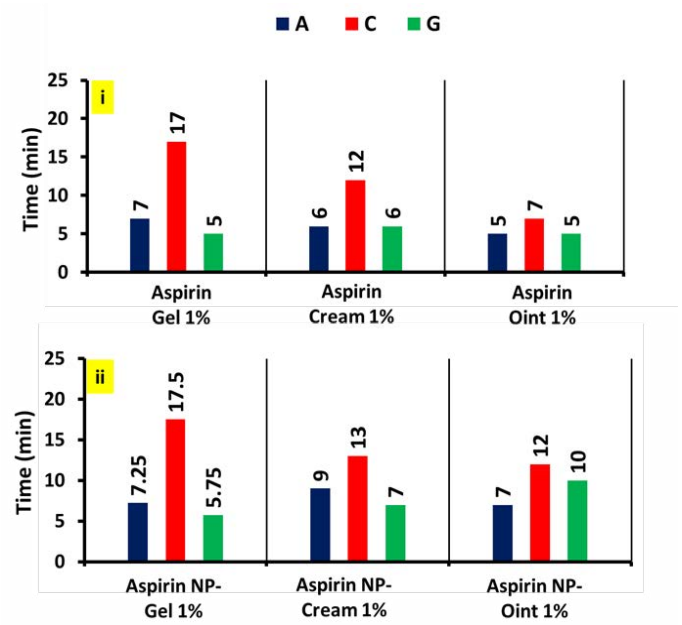

Figure 4. *Period records were required to elicit pain stimuli in tested animals using 1% aspirin ointment at different dosages. (i) ordinary dosage form, (ii) Nanoparticle dosage form.*

altering the size of the particles, the physical and chemical properties of the aspirin are also changed. This is due to the increased surface-area-to-volume ratio, which allows for greater interaction with molecular and cellular processes. Additionally, the frequency of continuous contact with linkers is enhanced, further contributing to the efficacy of the nanostructured aspirin preparation. Overall, this study sheds light on the incredible potential of nanotechnology in the field of medicine.

They have the unique ability to specifically target and deliver macromolecules and macromolecules right where they're needed, making them an incredible tool in the fight against disease. With their impressive carrier capacity, diverse sizes and shapes, and the ability to bind both hydrophobic and hydrophilic materials, nanoparticles are revolutionizing the way we approach therapy. It will greatly replace the broad-spectrum treatments that affect healthy cells and provides precision medicine with the help of these tiny but mighty particles [11].

Nanoparticles, or NPs for short, are tiny particles that have three distinct layers. At the surface is the outer layer which can be loaded with all sorts of functionalized small molecules, metal ions, surfactants, and polymers. The core layer is the central portion of the NP and is essentially the NP itself. Sandwiched in the middle are two cortex layers, the first made of a material that's chemically different from the core, and the second also a cortex layer. Recent research strongly supports Plate Chaudhary's (2012) claim that transdermal delivery systems (TDS) have captured the attention of scientists worldwide [12]. These innovative systems combine nanoscience with lipid science technology and have the potential to revolutionize the way we deliver drugs. They may even be the better option for drug delivery [13].

The study concluded that aspirin gel is the most effective form of pain relief, surpassing its ointment and cream counterparts. This discovery aligns with another study that found aspirin's low

water solubility decreases its effectiveness in gel formulations. Interestingly, the researchers found that the mice's dermal membrane favoured the lipophilic state of aspirin, resulting in rapid absorption that was dependent on its concentration gradient. Despite this, the ointment did not perform as well as the gel on the mice's skin, leading to weaker pain relief and slower absorption in addition to the already observed weaker flow rate. Overall, the findings suggest that aspirin gel is the optimal choice for pain relief due to its superior effectiveness and rapid absorption [14].

The gel is a water-based product that is often clear or translucent in appearance. It has a lightweight texture that is easily absorbed into the skin, making it a good option for those with oily skin. However, it may not be the best option for those with dry or sensitive skin, as it can be drying and may cause irritation.

Cream, on the other hand, is a water and oil-based product that has a thicker consistency than gel. It is a good option for those with dry or sensitive skin as it provides deep hydration and nourishment to the skin. Creams are often formulated with emollients, which help to lock in moisture and create a protective barrier on the skin. They are also typically more gentle than gels and are less likely to cause irritation or breakouts. However, creams may not be the best option for those with oily skin as they can be too heavy and may clog pores.

Ointments are the thickest and heaviest of the three products and are typically oil-based. They are designed to provide intense hydration and protection to the skin, making them a good option for those with extremely dry or damaged skin. Ointments are often formulated with occlusive agents, which help to seal in moisture and prevent water loss from the skin. They are also typically free of fragrances and other potential irritants, making them a good option for those with sensitive skin. However, ointments may not be the best option for those with oily or acne-prone skin, as they can be too heavy and may cause breakouts. In conclusion, while gel, cream, and ointment all serve the general purpose of moisturizing the skin, they have different compositions and textures that make them better suited for different skin types and purposes. Gels are ideal for targeting specific skincare concerns and are best for oily or acne-prone skin. Creams are perfect for those with dry or sensitive skin and provide deep hydration and nourishment. Ointments are the thickest and heaviest of the three products and are best for those with extremely dry or damaged skin.

These preparations could potentially serve as a template for the treatment of stubborn ailments of joints diseases or osteoarthritis [15-17], taking into consideration that the systemic anti-inflammatory properties [18-20] might be more effective than that of local application due to involvement of surrounding milieu and cellular secretome [21,22].

Conclusion.

In conclusion, systemic medication is not always the most effective or convenient option for patients. Topical TDS, such as gels, creams, and ointments, offer a viable alternative with fewer side effects. Aspirin nanoparticles, in particular, have shown promise in providing better pain relief and are more receptive to gels than other kinds. Patients should discuss their options with their healthcare provider to determine the best course of treatment for their specific needs.

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