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Aims and Scope	Greater Mekong Subregion Medical Journal is an online and printed, peer reviewed international scientific journal published by Mae Fah Luang University. The journal aims to publish articles in the field of basic and advanced clinical research in medicine and related health sciences, medical education as well as community medicine in Thailand, international and especially in countries of Greater Mekong Subregion. Manuscripts submitted to Greater Mekong Subregion Medical Journal will be accepted on the conditions that the author must not have previously submitted that paper to another journal elsewhere. The journal will not charge for any submission. The reproduction or copy of the articles included the pictures should be under the permission of the publisher.
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Publication Ethics

Publication ethics of Greater Mekong Subregion Medical Journal (GMSMJ)

Greater Mekong Subregion Medical Journal presents articles in the field of basic and advanced clinical research in medicine and related health sciences, medical education as well as community medicine in Thailand and international, especially in countries of Greater Mekong Subregion.

The journal publishes 3 issues a year: Issue 1 (January - April), Issue 2 (May - August) and Issue 3 (September -December). All submitted research articles and review articles will be evaluated by a single blinded peer-review process and reviewed by 2 experts who have knowledge, expertise, and experience in the field of medicine and related health sciences prior to publication. The journal encloses the information of authors and reviewers. In case of a difference of evaluation, the article evaluation will be considered and given a final decision.

Greater Mekong Subregion Medical Journal establishes the roles and duties for three different groups in the process of article publication: author (s), editor, and reviewers. The following information is given to the three groups of people so that they will strictly abide by its benefits of those concerns, including readers and others in academia.

Roles and duties of the author (s)

- Author (s) must report the occurred facts without distorting or giving any false information.
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- Reviewers should verify the repetition of the articles and plagiarism. Should they occur, these must be informed to the editor.

Contents


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Original Article

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Greater Mekong Subregion Medical Journal

A Comparative Study of Efficacy of Calamine Lotion versus Topical Corticosteroid in Intertrigo Treatment

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Abstract:

Background: Intertrigo is an inflammatory dermatitis caused by moisture, friction, and lack of ventilation. Topical corticosteroid has been used for intertrigo treatment with concerning of infection and side effects.

Objective: The objective of this study was to compare the efficacy between calamine lotion and topical corticosteroid by clinical and instrumental evaluation for the treatment of intertrigo.

Materials and Method: In this randomized split-side open-label prospective trial, Thirty-three patients with intertrigo enrolled at the Dermatology Clinic of Phramongkutklao Hospital, were randomly assigned to apply two types of topical treatments twice daily for 15 days on separated side (left and right) of the body. The degree of erythema was evaluated by instrumental and clinical using mexameter (erythema index) and visual analogue scale (VAS) at baseline and at 15 days. Subject-completed visual analogue scale was carried out by patients to evaluate the pruritus.

Results: All 33 patients showed significant improvement of erythema along with pruritus intensity from baseline for both groups ($p < 0.001$). However, there was no significant difference in the erythema index, erythema intensity and pruritus degree between topical corticosteroid and calamine lotion ($p > 0.05$). Mild skin irritation was described in only 1 case (3%) on the calamine lotion side.

Conclusion: Our results suggest that calamine lotion can be as effective as conventional topical corticosteroid in the treatment of intertrigo, so it would be considered an alternative option to avoid corticosteroid used.

Keywords: Calamine lotion, Intertrigo, Topical corticosteroid

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Introduction

Intertrigo is an inflammatory dermatitis induced by friction in conjunction with other stimulants such as humidity, perspiration, or inadequate ventilation.[1] It can be recognized by an erythematous moist patch in the intertriginous area, including the inframammary, groin, and abdominal folds, which can cause itching or burning sensation.[1-2] Secondary bacterial and fungal infections are commonly found.[3] Intertrigo occurs in 2.5% of adult patients, with an average age of 41.[4]

Topical treatments are now being explored as a therapy for intertrigo. There are numerous sorts, such as topical corticosteroids, antimicrobial compounds, skin barriers, zinc oxide ointments, and petrolatum. However, present studies are unable to determine whether sort of treatment produces superior benefits.[1, 5]

Calamine lotion is a commonly used treatment for several types of dermatitis.[6-7] It is also a highly safe drugs that has been approved by the U.S. Food and Drug Administration for use by infants, pregnant women, and breastfeeding mothers.[7] Calamine contains zinc oxide, which has anti-itchy, anti-bacterial, and anti-inflammation properties, and the component calamine powder has the effect of soothing and drying the skin with the following properties[6-9], calamine lotion is likely to be effective in treating intertrigo. From our experience, some patients showed improvement of their intertrigo without side effects after treatment with over-the-counter calamine lotion.

The objective of this trial was to compare the efficacy between calamine lotion and topical corticosteroids in treating intertrigo by assess the degree of erythema and pruritus.

Material and Methods

Study design

A randomized controlled trial was conducted from July 2022 to December 2023, enrolling 33 patients diagnosed with intertrigo by dermatologists at Phramongkutklao Hospital in Bangkok, Thailand.

Methods

We included patients aged 20 years and older who presented with a symmetrical intertrigo that has been diagnosed by dermatologists. Our participants were required to have not treated the rash area with any type of medication within a month and were not currently taking immunosuppressive drugs. We excluded patients who failed to apply medication more than twice, as well as those with suspected Infection in the rash area, from the study. Informed consent was obtained before participating in the study. The study protocol was approved by the Institutional Review Board of the Royal Thai Army Medical Department (R058h/65).

Demographic data, including age, gender, co-morbidities, body mass index, and affected areas were collected. The mexameter and erythema visual analog scale were used to assess the degree of erythema on both sides of the skin folds. The mexameter measures the erythema index objectively and consistently using light absorption spectra.[10] Mexameter values vary from 1 to 1000, where 1 represents white and 1000 represents red. Erythema visual analog scales (supplement No.1) were evaluated by the researcher, which were graded in to 4 stages (1 indicates very faint erythema; 2: faint erythema; 3: bright erythema; and 4: bright red). The degree of

pruritus was assessed by the patients using pruritus visual analog scales (supplement No.2), which were divided into 10 levels (0: no pruritus to 9: very severe pruritus). The erythema and pruritus levels were collected synchronously at baseline (day 1) and 15 days of treatment (day 15). Exclusion of infection was performed by wet smear with 10% potassium hydroxide at the beginning and end of treatment. Treatment-related adverse effects were also documented.

After collecting the initial data (at day1), the patients were randomly assigned to apply medicine to each side of their rashes with calamine lotion on one side and 0.02% TA cream (TA cream) on the other side. The topical medicines were applied twice a day and follow patients until day 15. Because of the difference between medical texture, double blinding the trial was not feasible.

Statistical analysis

The demographic data were presented as number, percentage, range and mean ± SD. Generalized Estimating Equation (GEE) was used to compare the efficacy of calamine lotion and topical corticosteroids. P-value ≤ 0.05 was considered statistically significant.

Results

The patients' demographic information was displayed in Table 1. Most patients were male, and the average age was 68 years old (range, 53-96 years). Dyslipidemia, high blood pressure, and diabetes were common disorders. The groins, axillae, inframammary folds, and buttocks were the area most frequently affected by rashes, respectively. The patients' mean BMI of 25 kg/m^2 was also discovered, which is in line with earlier research.[2] Before beginning therapy, preliminary data revealed that the amount of redness was measured using the mexameter.

Table 1 Patient Demographics (n =33)

Variable	Statistics data
Age	68.67 ± 13.2
Gender	
Male	17 (51.5%)
Female	16 (48.5%)
Co-morbidities	
Diabetes	9 (27.3%)
Hypertension	24 (72.7%)
Dyslipidemia	26 (78.8%)
Others	12 (36.4%)
Affected areas	
Groins	22 (66.7%)
Axillae	5 (15.2%)
Inframammary folds	5 (15.2%)
Buttocks	1 (3%)
BMI (kg/m^2)	25.18 ± 3.01

The results of therapeutic efficacy were summarized in Table 2. Calamine lotion and 0.02% TA cream were found to have similar initial redness and itching levels. After 15 days of treatment, calamine lotion and TA cream significantly reduced mean erythema index compared to baseline ($p<0.001$). Calamine lotion could reduce the mean erythema index by -89.17 (-117.67, -60.68), which is equivalent to a 20% reduction, whereas TA cream was able to reduce it by -95.6 (-121.45, -69.74), or a 22.35% reduction (Figure 1). For the evaluation of redness level by visual analog scale, calamine lotion and TA cream were able to reduce the average redness level by -1.15 (-1.43, -0.87) and -1.24 (-1.51, -0.98), respectively (Figure 2). The efficacy of the two medications in lowering redness level was not significantly different, as determined by mexameter ($p = 0.854$) and the visual analog scale ($p = 0.647$).

Both treatments were found to significantly reduce the itching level, as measured by a visual analog scale ($p < 0.001$). The average itching level was able to be decreased by -2.67 (-3.59, -1.74) and -3.36 (-4.36, -2.37) with calamine lotion and TA cream, respectively (Figure 3). This corresponds to the reduced amount of redness.

Table 2 The results of therapeutic efficacy

	Calamine	TA	p-value
Erythema index (mexameter)			
Baseline	426.39 ± 104.98	427.81 ± 114.3	0.901
15 days	337.22 ± 89.5	332.21 ± 95.51	0.756
Mean change	-89.17	-95.6	0.854
(95%CI)	(-117.67, -60.68)	(-121.45, -69.74)	
p-value	< 0.001*	< 0.001*	
Erythema (by VA)			
Baseline	2.27 ± 0.52	2.3 ± 0.53	0.744
15 days	1.12 ± 0.6	1.06 ± 0.66	0.601
Mean change	-1.15	-1.24	0.647
(95%CI)	(-1.43, -0.87)	(-1.51, -0.98)	
p-value	< 0.001*	< 0.001*	
Itching			
Baseline	5.12 ± 2.26	5.18 ± 2.64	0.857
15 days	2.45 ± 2.71	1.82 ± 2.23	0.126
Mean change	-2.67	-3.36	0.410
(95%CI)	(-3.59, -1.74)	(-4.36, -2.37)	
p-value	< 0.001*	< 0.001*	

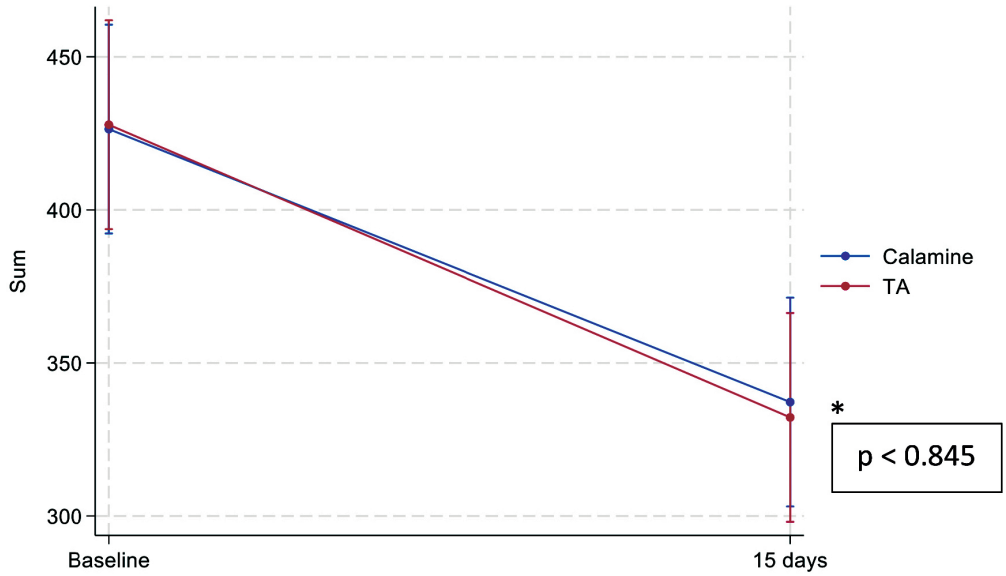

Figure 1 The graph demonstrates the average erythema index for calamine lotion and 0.02% TA cream before and after 15 days of therapy. (*significant reduction compared with baseline, p < 0.001)

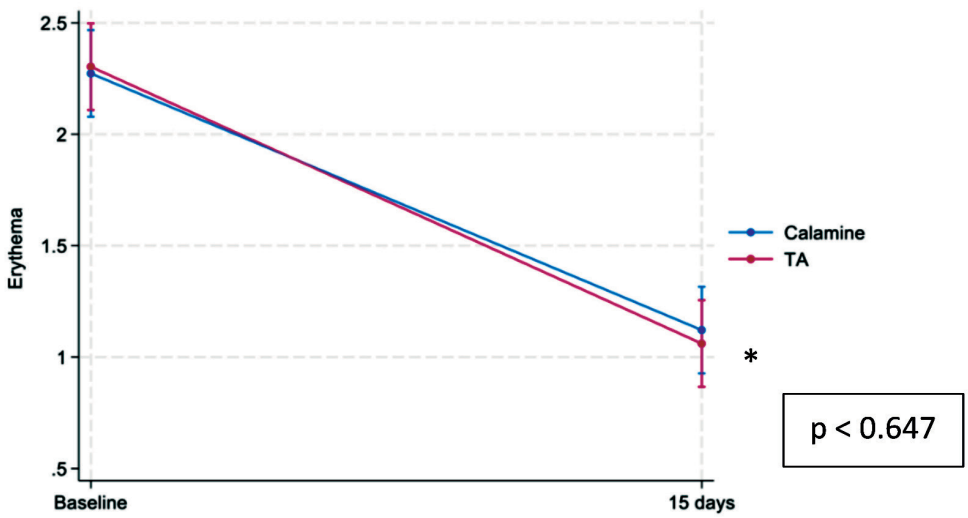

Figure 2 The graph demonstrates the average erythema level by visual analog scale for calamine lotion and 0.02% TA cream before and after 15 days of therapy. (*significant reduction compared with baseline, p < 0.001)

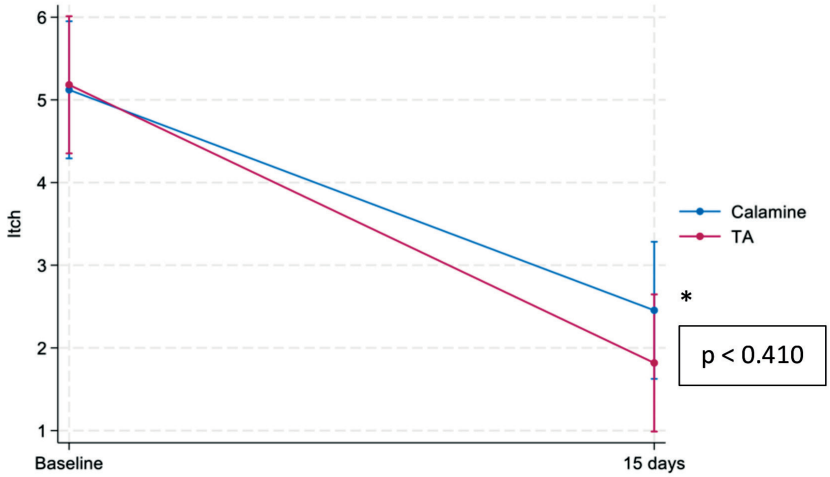

Figure 3 The graph demonstrates the average itching level by visual analog scale for calamine lotion and 0.02% TA cream before and after 15 days of therapy. (*significant reduction compared with baseline, $p < 0.001$

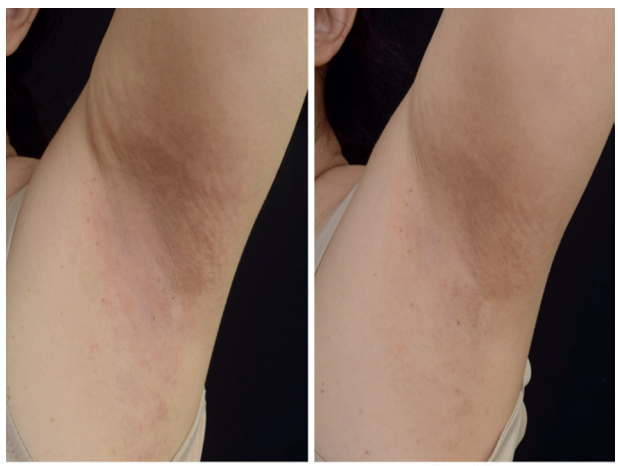

Figure 4 Patient treated with calamine lotion for intertrigo at the axilla before and after 15-days treatment.

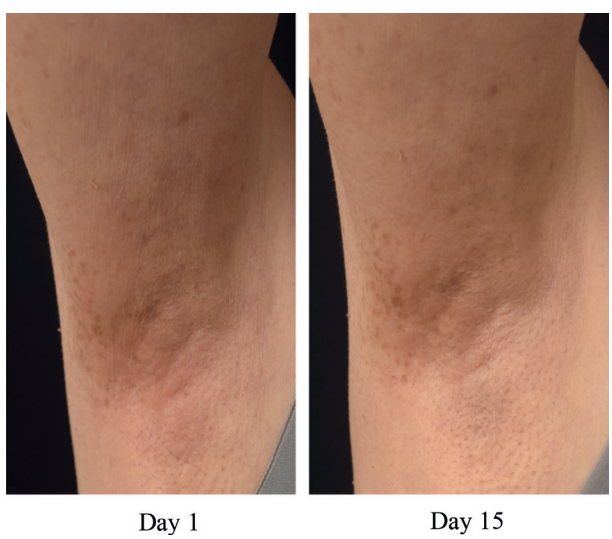

Figure 5 Patient treated with 0.02% TA cream for intertrigo at the axilla before and after 15-days treatment.

Treatment side effects were monitored throughout the trial, as shown in Table 3. One patient on the side was treated with calamine lotion reported irritation following the initial application. Following that, the irritation subsided. The patient could continue to receive treatment until the end. There were no further side effects discovered from applying both types of medications, such as allergic contact dermatitis, severe drug reactions, secondary infections, or skin atrophy.

Table 3 Treatment-related adverse events

Complications	Calamine lotion	TA cream
Skin irritation	1 (3.0%)	-
Contact dermatitis	-	-
Cutaneous infection	-	-
Skin atrophy	-	-
Anaphylaxis	-	-

Discussion

Our study was the first trial to evaluate calamine lotion with topical steroids for treating intertrigo. Furthermore, the efficacy of both medicines was evaluated using both instrumental and clinical measures. Both drugs were found to significantly reduce the level of redness of the rash and itching.

After 15 days of therapy, the side of the rash treated with topical corticosteroids showed a slightly greater reduction in erythema and itching severity than the sides treated with calamine lotion.

However, no significant differences were discovered. This suggests that there was no difference between the efficacy of the two therapies.

Mild irritation was observed in only 1 of the participants (3%) on calamine lotion side. It was discovered via observation that patients who were irritated frequently acquired rashes along with scratches that caused abrasions. According to Nijhuris, et al. (2021), treating intertrigo with zinc oxide ointment might cause itching if administered to an existing inflamed skin rash.[11] Both drugs showed no major side effects or new infections during the 15-day course of treatment. There were no side effects associated with steroid use in this trial. However, as intertrigo are a recurrent condition, the patient might need to keep using steroid therapy, which could lead to more steroids-related adverse effects such as fungal infection, skin atrophy and telangiectasia. Long-term follow up is needed for this condition.

In addition to the efficacy on minimized the redness and relieve the irritation, calamine lotion is widely available and cost-effective. Treatment is highly safe and conveniently accessible to patients. Short-term treatment and avoidance of the areas with abnormal skin barrier can decrease side effect of calamine lotion.

The limitation of our study was a small sample sized and no data on long-term follow up. Studies in larger populations with longer follow up are necessary.

Conclusion

Calamine lotion is as effective in reducing redness and itching as topical corticosteroids in treating intertrigo. As a result, calamine lotion may be a viable choice for intertrigo treatment.

Conflict of Interest

The authors do not have conflict of interest to be declared.

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Supplements

Supplement No.1: Erythema visual analog scale

Erythema grade	Score	Description
Very faint erythema	1	Skin has very light pink color.
Faint erythema	2	Skin reaction is more apparent with clear borders but still pink with more intensity.
Bright erythema	3	Erythema is apparent in bright pink and borders are clearly defined.
Very bright erythema	4	Skin is bright red, border are very well defined, capillaries and bruising may be visible.

Supplement No.2: Pruritus visual analog scale

VAS scoring	Meaning
0	No pruritus
1-3	Mild pruritus
4-6	Moderate pruritus
7-8	Severe pruritus
9	Very severe pruritus


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Special Article

GMSMJ Greater Mekong Subregion Medical Journal

Psychotropic Drugs and ASEAN Road Safety: The Need for New Legal Framework

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Abstract:

Background: Currently, ASEAN has policies but no uniform legislation controlling driving under the influence of psychotropic drugs. Numerous road safety concepts and theories may be used to improve road safety in ASEAN. However, member nations continue to under apply these principles.

Objective: The goals of this study are to investigate international theories and concepts for promoting road safety, the ASEAN concept of driving under the influence, global traffic strategies for dealing with driving while intoxicated, and to suggest the appropriate ASEAN-specific policies that can effectively prevent drugged driving.

Materials and method: A qualitative documentary research was conducted for this study. The scope of this study also includes global concepts and theories to promote road safety, concept of driving under the influences in ASEAN, concept of harmonizing road safety laws, international traffic strategies to dealing with impaired driving issues, and human rights and drug testing.

Results: In accordance with the United Nations' five pillars of road safety, ASEAN has focused on driving under the influence. ASEAN has no additional guidelines for controlling psychotropic drug use among drivers. In the case of cross-border driving, it is difficult for most individuals to know what blood alcohol concentration or drug levels are permitted for drivers in the country into which they are traveling. All human rights and drug testing issues must be addressed as part of ASEAN's implementation of the concept of drug testing among road users.

Conclusion: This article suggests that ASEAN should develop a clear policy to promote the prevention of drug-impaired driving and the consequences of such driving among ASEAN drivers. The prospective ASEAN Agreement for the Protection of Driving Under the Influence of Psychotropic Drugs and its Work Plan should be proposed. The ASEAN should support instruments for measuring alcohol and psychotropic drugs at border crossings in each coun-

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try. Finally, ASEAN should monitor each country, particularly during physical examination and drug testing procedures at checkpoints, traffic accident scenes, and while driving.

Keywords: Alcohol, Psychotropic Drug, Road Safety, Traffic Accident

Introduction

According to the 2030 Agenda for Sustainable Development, which has 17 goals for eradicating poverty and ensuring sustainable development, Target 3.6, focuses on reducing road fatalities and injuries, is a significant key issue as the reduction of premature mortality from noncommunicable diseases (NCDs) for making of well-being of all ages.[1] One of the most concerning issues for global health is road traffic fatalities and injuries. In accordance with the World Health Organization's (WHO) global status report on road safety, an updated 2016, the number of road traffic deaths remained high, measuring 1.35 million deaths per year, the 8th leading cause of death for people of all ages, the first cause of death for children and people aged 5-29, and death rates in low-income countries were 3 times higher than in high-income countries. Over the last 15 years, the global rate of road traffic deaths has been around 18 deaths per 100,000 population.[2] In 2016, the leading causes of death that contribute to men having a lower life expectancy than women were ischemic heart disease (0.84 years), followed by road injuries (0.47 years).[3] The African Region (26.6 deaths per 100,000 people) and South-East Asia Region (20.7 deaths per 100,000 people) had the highest rates of road traffic deaths, both of which were significantly higher than the global average.[3] As a result, road injuries and fatalities are unavoidably the most important factors influencing the death rate of global citizens.

In accordance with the World Drug Report 2022, cannabis was the most widely used drug in the world, followed by opioids, amphetamines, cocaine, and ecstasy. An approximated 284 million people worldwide aged 15-64, the vast majority of whom were men, had used a drug in the previous 12 months.[4] Table 1 displays the global estimates of the numbers of drug users in millions (2020). Following global drug use and road safety policies, the WHO revealed that a total of 1,252,071 road traffic deaths occurred in 2013. These deaths were due to alcohol use (188,151 cases) and illicit drug use (39,625 cases).[5] In the group of illicit drug-related traffic death, the use of amphetamines was the biggest illicit drug contributor to road accidents (51%), followed by cannabis (22%), cocaine (14%), and opioids (13%), respectively.[5] There are three types of psychotropic drugs that are relevant to the risk of a motor vehicle accident: illicit drugs (such as cannabis, cocaine, heroin, and methamphetamine) used for recreational purposes; prescription drugs (such as benzodiazepines, opioid analgesics, and antidepressants), which can be legally purchased or given out by a doctor for treatment; and new psychotropic substances (such as synthetic cannabinoids and synthetic cathinones), which are created for recreations without medical purposes.[5]

Table 1 World drug report 2022 of global estimates of the numbers of drug users in millions (2020)[4]

Drugs (millions users)				
Cannabis	**Opioids**	**Amphetamines**	**Cocaine**	**Ecstasy**
209 (between 149 to 265)	61 (between 37 to 78)	34 (between 29 to 41)	21 (between 18 to 26)	20 (between 9 to 36)

The chance of a crash and its severity, which can result in fatalities and severe injuries, are both greatly increased when driving after drinking alcohol. Twenty percent of fatally injured drivers in high-income countries had blood alcohol concentrations (BAC) that are higher than the legal limit. According to studies conducted in low- and middle-income countries, between 8% and 29% of drivers who suffered non-fatal injuries and between 33% and 69% of drivers who suffered fatal injuries had drunk alcohol before their collision.[6] While 17,000 people are murdered every year in traffic accidents attributed to drunk driving in the United States, 34% of driver fatalities and 23% of motorcycle fatalities in Colombia have been linked to speed and/or alcohol.[6] Around 20% of fatally injured drivers in Europe, for instance in Sweden, the Netherlands, and the United Kingdom, have blood alcohol levels above the legal limit.[6] In the case of cannabis and road safety, since its legalization in Uruguay in December 2013, followed by Canada in October 2018, some academics have speculated that non-medical cannabis use may increase the likelihood of a collision.[7] Many questions were raised, such as the relationship between cannabis and driving skills, the impact of tolerance to cannabis effects on road safety, and the cannabis dose-response relationship to change a car's driving.[7] An important substance that affects cannabis-impaired driving, also known as delta 9-tetrahydrocannabinol (THC), can impair cognitive and movement under conscious mental functions. Many studies found that drivers with blood THC concentrations of 5 ng/ml or higher were more likely to be involved in traffic accidents.[8] As more states in the United States legalize recreational and medicinal cannabis, the number of people driving under the influences of this drug has risen dramatically. Cannabis can impair attentional allocation, body steadiness, choice reaction time, danger perception, distance estimation, information processing speed, short-term memory, signal detection, stress, task switching, time estimation, useful field of view, visual search, and working memory in drivers.[9] An epidemiological study discovered that when a serum THC concentration reaches 7-10 ng/ml, which is comparable to 50 mg/dl of BAC, driving-relevant skill impairment will occur.[10]

Amphetamine and amphetamine-like compounds including methamphetamine and 3, 4-methylendioxymethamphetamine (MDMA, ecstasy), cocaine, and opioids are other significant illicit drugs that can influence cognitive deficits. Each of them is associated with both acute and long-term cognitive consequences, which can induce the possibility of driving impairment. The recommended cut-off levels for cocaine, THC, morphine, codeine, MDMA, amphetamine, and methamphetamine, is shown in Table 2.[11] As part of prescribed drugs, in general, when they are taken as doctor's prescription, most drugs do not pose a significant risk of causing

a traffic accident. However, drug abuse can sometimes result in impairment. Serotonin is classified as low risk drugs causing impairment, whereas sympathomimetic (e.g. pseudoephedrine), less sedating histamine (e.g. cetirizine), and diabetes medications are classified as low to moderate risk drugs. Muscle relaxants (e.g. orphenadrine) are in the moderate risk category, while anticonvulsants (e.g. phenytoin), sedating antihistamines (e.g. chlorpheniramine), antipsychotics (e.g. haloperidol), benzodiazepines, opioid analgesics, tricyclic antidepressants, and tetracyclic antidepressants are in the high-risk category.[12] However, in the Association of Southeast Asian Nations (ASEAN), the use of policies to control international illicit drug use as well as prescribed drug use to promote road safety has been a challenge.

Table 2 The recommended cut-off levels for each substance that can affect driving skills[11]

Cut-off levels (ng/ml)						
Cocaine	**THC**	**Morphine**	**Codeine**	**MDMA**	**Amphetamine**	**Methamphetamine**
1-80	1-80	1-80	1	1-300	1-600	1-200

To recognizing the problem, currently ASEAN has policies but no unified law governing driving under the influence of psychotropic drugs. Therefore, driving regulations must be enforced according to each country's laws. The differences in laws among ASEAN countries regarding driving under the influence of psychotropic substances create four main issues. Firstly, driving under the influence of certain drugs, particularly cannabis, is not considered illegal in Thailand but is prohibited in many other countries within ASEAN. Secondly, each country has different legal limits for alcohol levels while driving, leading to problems when driving cross borders. For instance, a driver who legally consumes alcohol in one country may be breaking the law in another country with lower alcohol limits. Thirdly, physical examination requirements for drivers vary among ASEAN countries, with unclear guidelines on drivers' rights to refuse testing. Finally, ASEAN lacks clear guidelines for different types of psychotropic drugs, leading to varied law enforcement and testing standards, causing problems with cross-border law enforcement and creating inconsistencies in road safety measures. Following the lack of a clear ASEAN policy for preventing driving under the influence of psychotropic drugs hinders road safety efforts in this region. Additionally, the lack of harmonization in laws governing drivers under the influence of drugs among ASEAN countries results in inconsistent law enforcement across borders.

Currently, there are numerous road safety concepts and theories that can be applied to improve road safety in ASEAN. However, there is still a lack of widespread application of these principles in practice among member countries. The objectives of this study are to investigate global concepts and theories, including, Vision Zero policy, Safe System approach, and five pillars of road safety management, in order to promote road safety in the ASEAN, to investigate the concept of driving under the influences in the ASEAN, to investigate the international traffic strategies to dealing with impaired driving, and finally, to propose the appropriate measures which can effectively prevent driving under the influences of drug for the ASEAN.

Materials and Method

This study is a qualitative documentary research that uses laws, textbooks, research articles, review articles, theories, and policies from international databases relating to driving under the influences. The process of this article also includes, first, an investigation of concepts and theories in order to promote road safety, and ASEAN traffic measures in regards to driving under the influence of drugs. Second, a summarization and discussion of all concepts, theories, and related laws will be conducted. Finally, the creation of novel ASEAN measures that can improve road safety in accordance with driving under the influences will be done. According to road safety policies including, the Vision Zero policy and the Safe System approach, a traffic accident is not an uncontrollable event but can be avoided by utilizing controllable factors. In this case, legal and policy enactment may be beneficial. However, each member of the ASEAN has different policies on controlling drug driving. Therefore, the scope of this study also includes global concepts and theories to promote road safety, concept of driving under the influences in ASEAN, concept of harmonizing road safety laws, international traffic strategies to dealing with impaired driving issues, and human rights and drug testing. The findings will be interpreted as the appropriate measures for the ASEAN in order to improve road safety.

The meaning of each term that use in this article is shown below.

1) Alcohol: A psychotropic drug that is a bioactive compound found in beverages such as beer, wine, whisky, and liquor, and is chemically known as ethanol or ethyl alcohol.

2) Driving under the influences (DUI): The act of drivers consuming any psychotropic drugs before or while driving, which may affect their emotion and consciousness.

3) Illicit drug: A psychotropic drug which is classified as an illegal drug or narcotic drug.

4) Impaired driving: Driving while intoxicated or under the influence of psychotropic drugs.

5) Psychotropic drugs: Drugs or other substances that alter or influence the brain functions, resulting in changes in consciousness, feelings, emotions, or habits, for example, ethyl alcohol, amphetamines, cannabis, cocaine, prescribed drugs, and illicit drugs.

6) Traffic accident: An unfortunate incident that occurs on the road or land unexpectedly and unintentionally, usually resulting in injury or harm.

Results

The outcomes of scrutinized documentary reviews are described below.

Global Concepts and Theories to Promote Road Safety

The goal of the Vision Zero policy is that no one dies or is seriously injured in a traffic accident, then the road transportation system should be designed to meet those requirements, particularly the concept that road safety system designers are responsible for the tolerance of kinetic energy of the human body. Vision Zero is widely regarded as a promising road traffic safety policy. This impression is supported by official statistics in Sweden, which show that the number of road deaths had been cut in half and the number of deaths among car users had decreased by 60% between 2000 and 2010, resulting in Sweden's roads remaining among the safest in the world.[13] The Vision Zero philosophy for road traffic safety has been adopted in other countries, for example, Norway, Denmark, and the United States. A policy content analysis framework is divided into four steps: policy decision, policy problem, policy goal, and policy measures.[13] Table 3 depicts an example of

road safety analysis for driving under the influences using Vision Zero policy. Some toolkits that can be used to reduce fatalities and injuries in tandem with the Vision Zero policy include 1) education for road users, 2) law enforcement, and 3) structural improvements, for example, the installation of median barriers, pedestrian islands, roundabouts (traffic circles), and speed humps.[14]

Table 3 Road safety analysis for driving under the influences using Vision Zero policy

	Policy decision	Policy problem	Policy goal	Policy measures
Road safety analysis	- Local government decision - National government decision	- Drivers are intoxicated or under the influence when they drive. - Human bodies are fragile.	- Eradicate behaviors of driving under the influence.	- Legal enactment - Legal enforcement - Policy support

The Safe System approach prioritizes safety and acknowledges that the road transportation system is complicated. It also recognizes that in order to prevent fatalities and serious injuries from occurring, people, cars, and the road infrastructure must interact in a way that assures a high level of safety. Consequently, a safe system is made up of four components, including, 1) safe roads and roadsides, 2) safe speeds, 3) safe cars, and 4) safe road users. This system's objectives include accommodating human error, incorporating road and vehicle designs that keep crash forces within the range of human tolerance, and inspiring road designers to create and maintain roads, produce vehicles, and manage safety initiatives so that drivers share responsibility for safety.[6] Both the Vision Zero policy and the Safe System approach can be applied to road safety promotion in the policy formulation stage and in the process of integrating the analysis of the root causes of errors leading to traffic accidents.

Concept of Driving Under the Influences in ASEAN

The ASEAN issued "The Agreement on the Recognition of Domestic Driving Licenses Issued by ASEAN Countries" in 1985, with the general condition that the holder of a license issued by one of the ASEAN countries and intends to stay temporarily in the territory of another country be able to drive vehicles of the category for which the license is granted. However, he is liable for traffic violations under the laws of the country into which he drove the vehicle.[15] Now the ASEAN community comprises of Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. The ASEAN countries' road safety context has been related to the United Nations' five pillars of road safety (please see Table 4).[16] As part of pillar IV, an indicator involving drug and/or substance control has been appealed to set each country's national drug-driving law. In the national drink driving law, for example, the policies include the use of random breath testing and/or police checkpoints. The blood alcohol concentration (BAC) limit varies by country, ranging from 0.00 mg/dl (for commercial vehicle and/or motorcycle drivers) to 80 mg/dl for the majority of drivers.[16]

The "ASEAN Regional Road Safety Strategy" has established specific guidelines for preventing driving under the influence, such as providing roadside alcohol monitoring devices for general driving and ensuring that commercial drivers are licensed and fit to drive, including checking a driver's license, measuring alcohol levels, and implementing programs to reduce fatigue from driving.[16] It can be observed that the five pillars of road safety management have been expanded upon in terms of road safety management systems and post-crash response beyond what is outlined in the Safe System approach, which can be utilized as tools in designing road safety in the overall context of ASEAN.

Table 4 The ASEAN's five pillars of road safety management from the ASEAN Regional Road Safety Strategy[16]

Pillar I Road safety management	Pillar II Safer roads and mobility	Pillar III Safer vehicles	Pillar IV Safer road users	Pillar V Post-crash response
- Lead Agency - Funded in national budget - National road safety strategy	- Formal audits for new road construction - Regular inspections of existing road infrastructure - Policies to promote walking or cycling, encourage investment in public transport, and separate road users to protect vulnerable road users	- UN World forum on harmonization of vehicle standards - New car assessment programme - Front and rear seat-belts	National laws for; - Speed limits, - Drink driving - Motorcycle helmet - Seat-belt - Child restraint - Mobile phones while driving - Drug-driving law	- Emergency Room based injury surveillance system - Emergency access telephone number

As part of the psychotropic drug control, the history of ASEAN's illicit drug policies dates back to 1976, when the Heads of Government issued "the Declaration of ASEAN Concord", which resulted in the signing of "the ASEAN Declaration of Principles to Combat Narcotic Drug Abuse" by the Foreign Ministers of the five ASEAN founding members later that year. ASEAN leaders endorsed the concept of "a Southeast Asia free of illicit drugs, free of their production, processing, trafficking, and use" in 1997. The ASEAN Foreign Ministers signed "the Joint Declaration for a Drug-Free ASEAN" by 2020 in July 1998. Following that, in July 2000, the ASEAN Foreign Ministers agreed to move the target year for achieving a drug-free ASEAN to 2015.[17] The "ASEAN Work Plan on Securing Communities Against Illicit Drugs 2016-

2025," adopted by the 5th ASEAN Ministerial Meeting on Drug Matters (AMMD) in Singapore on October 19-20, 2016, is an updated version of ASEAN drug policies, which their activities also range from national and regional level activities, law enforcement, preventive education, research, treatment and rehabilitation, alternative development, and extra-regional cooperation, respectively.[18] The ASEAN Work Plan 2016-2025 is based on the previous "ASEAN Work Plan on Combating Illicit Drug Production, Trafficking, and Use, 2009 to 2015." The ASEAN Work Plan 2009-2015 focused on significant and sustainable reductions in illicit crop cultivation, illicit manufacturing and trafficking of drugs and drug-related crimes, and the prevalence of illicit drug use.[18]

Concept of Harmonizing Road Safety Laws

Integrating or harmonizing the laws of different countries entails replacing existing national laws with general rules, such as those established by the United Nations Commission on International Trade Law (UNCITRAL), the Organization for the Harmonization of Corporate Law in Africa, the International Institute for the Unification of Private Law (UNIDROIT), the Principles of European Contract Law (PECL), and the Principles of Asian Contract Law (PACL). The benefits and drawbacks of replacing existing local laws with new rules shared by a group of countries include losing the benefit of expertise gained from one's own system and having to comprehend a novel set of rules.[19] As part of the ASEAN, one of the primary responsibilities of "The ASEAN Consultative Committee on Standards and Quality" (ACCSQ) is to create "the ASEAN Guidelines on Good Regulatory Practices" (ASEAN Guidelines on GRP). These guidelines are intended to assist ASEAN Member States in developing and implementing appropriate regulatory approaches for the preparation and application of technical regulations, which also adhere to the Technical Barriers to Trade (TBT) Agreement, declared by the World trade Organization (WTO).[20] The ACCSQ has developed three harmonized regulatory regimes including, 1) the Agreement on the ASEAN Harmonised Cosmetic Regulatory Scheme, Schedule B: ASEAN Cosmetic Directive (ACD) (2003), 2) the Agreement on the ASEAN Harmonized Electrical and Electronic Equipment (EEE) Regulatory Regime (AHEEERR) (2005), and 3) the ASEAN Agreement on Medical Device Directive (AMDD) (2014). The AHEEERR and ACD are monitoring initiatives to promote market integration in particular fields. The AMDD requires Member States to guarantee that only compliant medical devices are available in the marketplace. It calls on ASEAN Member States to adopt common templates for technical document submission, conformity declarations, and post-market surveillance, as well as medical device standards and risk classification. Harmonized regulatory regimes in all three sectors force Member States to harmonize their domestic regulatory processes and requirements.[21] As a member of the ASEAN Economic Community (AEC), which was established on December 31, 2015, the Competition Law has a direct effect on its member countries, particularly in business practices.[22] It can be seen that ASEAN has good practices in harmonizing laws between countries through the implementation of "Agreements," which are jointly recognized international principles. ASEAN has regional guidelines to increase equity in business practices, however, the policies do not cover driving under the influences. As a result, harmonizing ASEAN psychotropic road user regulations appears to be a long way off.

International Traffic Strategies to Dealing with Impaired Driving Issues

Many strategies have been used to

prevent and control impaired driving, but they may differ across global regions. The following are examples of effective impaired driving laws that have been enacted around the world; 1) setting the blood alcohol concentration limit to 5 mg/dl or even zero mg/dl, 2) creating reasonable penalties for convicted offenders who drive under the influences (e.g. license revocation/suspension, appropriate fine levels, mandating alcohol ignition interlocks, and appropriate substance abuse treatment program) and 3) impaired driving laws for teenagers (e.g. minimum legal drinking age laws, zero tolerance laws for young drivers, and graduated driver licensing laws for young drivers). Policy support instruments also include 1) social marketing and public education (e.g. mass media campaign and community activities), and 2) increase the likelihood of detecting impaired driving (e.g. random breath test, sobriety checkpoints, saturation patrols, and publicity of novel enforcements). Finally, some effective impaired driving offenders' sanctions, which can promote road safety, can be applied for international traffic strategies including, 1) home confinement systems with electronic monitoring of blood alcohol tests, 2) vehicle seizure or impoundment program, 3) vehicle registration and license plate confiscation program, and 4) ignition interlock system.[23] Enforcement, however, may be insufficient due to a variety of factors such as socioeconomics, capacity, and politics. One way to alleviate the problem of road safety is to ensure that the regulation or law states very clearly how enforcement will be performed and who will be liable for enforcement. Effective enforcement measures used to prevent road traffic accidents include 1) stationary speed enforcement, 2) patrolling, 3) reducing the blood alcohol limit, 4) breath testing at random, 5) drunk - driving enforcement, 6) seat belt enforcement, 7) speed cameras, 8) red light cameras, 9) fines, license suspension, imprisonment, 10) warning letters, 11) demerit point system, 12) driving license suspension.[24] In summary, international traffic strategies emphasize the importance of comprehensive and well-enforced impaired driving laws and policies to promote road safety and reduce accidents.

Human Rights and Drug Testing

Following the second world war, the modern era of human rights recognition started on December 10, 1948, in Paris with the adoption of "the Universal Declaration of Human Rights" (UDHR) by the United Nations General Assembly, General Assembly Resolution 217 A (III). Representatives from all over the world came together to draft and proclaim the inherent dignity and inalienable and equal rights of all members of the human family. The UDHR is a universal standard of achievement for all peoples and nations.

Such details of the UDHR relating to human rights and drug testing, also include;

- Article 3 "Everyone has the right to life, liberty and the security of person."
- Article 9 "No one shall be subjected to arbitrary arrest, detention or exile."
- Article 11 "Everyone charged with a penal offence has the right to be presumed innocent until proved guilty according to law in a public trial at which he has had all the guarantees necessary for his defense".[25]

After the enactment of the UDHR, some regulations and organizations were established. The United Nations General Assembly adopted "the International Covenant on Economic, Social, and Cultural Rights" (ICESCR) and "the International Covenant on Civil and Political Rights" (ICCPR) on December 16, 1966. These are frequently referred to as "the International Covenants," and when combined with the UDHR, they form "the International Bill of Human Rights." The ICESCR and the ICCPR outline that everyone is entitled to, such as equality between men and women, freedom from discrimination, freedom of movement,

freedom of non-citizens from arbitrary expulsion, freedom from slavery, freedom from torture, right to be treated with humanity in detention, right to liberty and security of person, and right to a fair trial.[26] Therefore, the driver's arrest and physical examination, which would be a violation of international human rights principles, cannot take place. The Office of the High Commissioner for Human Rights (OHCHR) is the leading United Nations (UN) agency in the field of human rights, with the unique objective of advancing and protecting all human rights for everyone. The High Commissioner for Human Rights' role also includes, first and foremost, carrying out the functions specifically given to him or her by the General Assembly in its Resolution 48/141 of December 20, 1993, and results in a significant of policy-making bodies. Second, it advises the Secretary-General on the United Nations' human rights policies. Third, ensures that the human rights program's projects, activities, organs, and bodies are supported. Fourth, the OHCHR represents the Secretary-General at meetings of human rights organs and other human rights activities. Finally, it carries out special assignments as directed by the Secretary-General.[27] Then the United Nations General Assembly A/RES/60/251 established "the United Nations Human Rights Council" (UNHRC), based in Geneva, to replace the Commission on Human Rights on March 15, 2006. This Council is responsible for promoting universal respect for the protection of all human rights and fundamental freedoms for all, without discrimination of any kind and in a fair and equal manner, as well as addressing situations of human rights violations, including gross and systematic violations, and making recommendations on these violations. Furthermore, it encourages effective coordination and mainstreaming of human rights within the UN system.[28] Thus, international human rights frameworks and institutions play an important role in protecting fundamental rights and ensuring equitable treatment for all individuals, and can be used to improve international road safety among ASEAN members, particularly in terms of drug-driving testing.

Discussion

The ASEAN has focused on driving under the influence, particularly alcohol, but some issues should be addressed. Firstly, according to the ASEAN Regional Road Safety Strategy, ASEAN aimed to promote road safety in accordance with the United Nations' five pillars of road safety. However, this strategy is not mandatory or obligatory for member countries to implement. There is also a lack of analysis of the underlying infrastructure of impaired driving, which leads to traffic accidents. Furthermore, it focuses on blood alcohol concentration without taking into account prescribed or illicit drugs. Despite the fact that ASEAN announced the ASEAN Work Plan on Securing Communities against Illicit Drugs 2016-2025, it makes no mention of driving under the influence of psychotropic drugs. The harmonization of laws in ASEAN appears only in the protection of trade barriers from the technical guidance of ACCSQ, which was generated in terms of ASEAN Agreements. To promote legal harmonization, an example from the harmonized laws in the European Unions (EU) should be mentioned. The harmonization and integration of domestic substantive laws as part of EU law have been well developed in the European Union, whereas similar merging and harmonization of procedural rules has not actually happened.[29] There is presently no harmonized EU-level approach to combating drug-driving legislation. However, a variety of options for guiding EU-level action are available, including, opinions, recommendations, regulations, decisions, and directives.

The EU Directive appears to be the best option because Member States are required to align themselves with the European goal but are free to apply their own regulations. Driving should be prohibited for anyone who uses or abuses psychotropic substances, according to EU Directive levels.[30] In the EU, the concept of driving under the influence of drugs and/or alcohol is addressed by the United Nations driver's permit. Driving under the influence, according to the UN, can impair coordination, decision-making, hearing, judgment, sight, and touch, potentially increasing the risk of an accident. The permitted BAC level for driving should not exceed 50 mg/dl of blood or equivalent, and drivers may not operate a vehicle with a BAC level greater than 20 mg/dl while on duty. Other drugs and/or substances, on the other hand, have no restrictions or cut-off levels.[31] According to the global plan developed by the WHO and the UN to guide and support the implementation of "the Decade of Action for Road Safety 2021-2030," recommended actions to ensure safe road use include the establishment of blood alcohol concentration (BAC) limits to prevent impaired driving (drink- and drug-driving), with specific provisions for beginner and expert drivers.[32] Then, all member states of the EU issue driving licenses in accordance with Section 15, drug and medicinal product, Annex III, the Directive 2006/126/EC of the European Parliament and of the Council. In terms of abuse, driving licenses will not be issued or renewed to applicants or drivers who are dependent on or regularly use psychotropic substances.[33] Therefore, each country then enacted the legal provisions in drug control laws or road traffic laws, addressing the substances, the levels of penalties, and any blood-drug or impairment levels, resulting in drivers being stopped and evaluated at any time or if the police require. However, different approaches exist across Europe, with national laws separating or combining the goals of road safety and illegal drug control. In some countries, such as Finland, drivers found with traces of illicit substances in their bodily fluids may be prosecuted for illicit drug consumption, whereas in Belgium and the United Kingdom, the drug tests' results conducted under road traffic laws cannot be used for any other criminal offense. Like penalty ranges, the punishments for drug-driving violations vary widely between countries, ranging from a few months license suspension to a minimum of a year in others.[34] The EU Directive techniques allow individual countries to establish their own legal measures to regulate driving under the influences. However, the ASEAN's integrity is not binding strongly as in EU. It highlights that the existing regional harmonized regulatory regimes among ASEAN members also lacks of comprehensive guidelines for addressing driving under the influences. Even though it also suggests considering the EU Directive as a potential model for harmonization, which includes blood alcohol concentration limits and restrictions on drug use for driving, however, this method may not be fully implemented for ASEAN. As a result, the legal use of terms such as "Agreement" and "Work Plan" that will result from the establishment of meetings among ASEAN members is advised.

ASEAN does not have any additional guidelines to control psychotropic drug use among drivers. Following a review of international traffic strategies for dealing with impaired driving, many countermeasures for ASEAN members can be implemented including, legal enactment, legal enforcement, policy support, and alternative justice for controlling driving offenders, which should be combined with concepts and theories to promote road safety at both the micro- and macro-levels using the Vision Zero policy and the Safe System approach. Sharing

experiences from Sweden, the model country for Vision Zero policy, Sweden is one of the safest road use countries in 2021, with only 18 deaths per 1,000,000 people, compared to the EU average of 44. This rate fell from 20 deaths per 1,000,000 people in 2020, and 22 deaths per 1,000,000 people in 2019.[35] As part of the legal enforcement, police conduct both random breath testing and directed alcohol checks. Drivers will be systematically inspected for drink-driving when they are stopped for any reason (e.g. speeding, and seatbelt use). If the breathalyzer detects alcohol levels above the legal limit, the driver will be transported to the police station for further testing. Since 2010, the amount of alcohol roadside police tests in Sweden has decreased dramatically, falling from nearly 2.7 million in 2010 to 1.3 million in 2019. To deal with limited police resources, discussions are currently under way about allowing non-police personnel to conduct random breath tests. Sweden offers rehabilitation and an alcohol interlock program to drink-driving offenders in order to promote road safety. Driver rehabilitation is frequently part of a probation sentence, but Sweden also has a voluntary program called SMADIT (Joint action against alcohol and drugs in traffic), which aims to quickly offer treatment to suspicious drink and drug drivers if they require assistance in overcoming their addiction. They can join the program as soon as they are suspected and do not have to wait for a sentence. Instead of having their license revoked, they will participate in an interlock program.[36]

ASEAN implemented an agreement on driving licenses that can be used by all state members. A driver must be held responsible for all traffic violations under the laws of the country into which the vehicle was driven. In the case of cross-border driving, it is difficult for most individuals to know what blood alcohol concentration or drug levels are permitted for drivers in the country into which they are traveling. The alcohol interlocks program is one of the interesting programs that has been used to protect driving under the influence in cross-border areas. This program requires drivers to push their breath into an interlock device that is linked to the vehicle ignition system; if that device detects alcohol on your breath, the vehicle will not start, which became a part of rehabilitation programs for drink drivers since 1999. In 2013, Sweden launched a pilot project to install a fast-moving automated 'Alco Gate' at the Port of Gothenburg (please see Figure 1). The Alco Gate trial use technology similar to alcohol interlocks in the setup of checkpoints for all transport vehicles arriving Sweden via ferry. The goal was to enforce drink-driving controls along the country's maritime borders and ensure that no driver traveling to or from Sweden was under the alcohol influence. The Alco Gate seems to be a successful and direct measure to combat drink driving among commercial drivers. Before entering the country by ferry, drivers must blow into a breathalyzer connected to a gate. The automatic system takes just a few seconds for each driver, and the checks have no effect on traffic flow.[37]

Figure 1 Alco Gate in Sweden[37]

Finally, as part of the application of the concept of drug testing among road users in ASEAN, all of the above-mentioned human rights and drug testing issues must be followed. Then everyone has the right to drive, is free from arbitrary arrest, and is presumed innocent until proven guilty in a fair public trial. The ASEAN state members must adhere to all human rights declaration principles under the protection of UNHRC, particularly during physical examination and drug testing procedures. Many developed countries, including the United Kingdom, Norway, Germany, Ireland, and New Zealand, have anti-drug-driving laws in place to promote human rights protection. Drug detection methods used in each country include oral fluid collected and field impairment assessment at the roadside for drug screening test, and blood drawn at a police station or hospital, then sent to a laboratory for drug confirmation test. The investigation must begin with non-invasive techniques before moving on to invasive or intrusive techniques. Patients who provide prescribed drugs can use a medical defense; if they are not impaired and use a prescribed product as directed, they will not be classified as illicit drug users.[38] The suggestions from this article is also shown below;

1) Policy to control the influence of psychotropic drugs on driving for ASEAN: The ASEAN should have a clear policy on the use of psychotropic drugs while driving. Such policies should complement any legal measures to promote the prevention of drug-impaired driving and its consequences among ASEAN drivers. ASEAN should assist all state members by analyzing each country's policies and infrastructures in order to promote road safety and reduce the rate of psychotropic drug use among drivers. According to ASEAN's legal enforcement often taking the form of "Agreements," which are cooperative arrangements to establish best practices and promote trade and investment facilitation rather than direct legally binding regulations like EU Directives, there has not been a specific "Agreement" in the past for controlling the influence of psychotropic drugs on driving.

This could potentially lead to issues regarding member country acceptance of principles and ASEAN's pathway towards enhancing domestic traffic laws. Another possible approach to controlling the influence of psychotropic drugs on driving without creating new agreements is to enhance the details of driving influence control within "the Agreement on the Recognition of Domestic Driving Licenses Issued by ASEAN Countries," addressing current situations. This would necessitate discussions with relevant agencies of member countries to design mutually agreed-upon agreements on this matter.

2) Legal measures to control the influence of psychotropic drugs on driving for ASEAN: ASEAN has been effective in adopting international legal principles for controlling driving within member countries. However, there should be clear legal measures to control the influence of psychotropic substances on driving internationally, particularly concerning driver's license issuance, license renewal, testing individuals with a history of alcohol misuse, drug addiction, or drivers using other substances that may affect driving performance. Similar to the legal measures of the European Union, this aims to enhance road safety.

3) Legal measures to prevent cross-border driving under the influence of psychotropic drugs in ASEAN countries: ASEAN should consider improving regulations or guidelines for testing drivers for psychotropic drugs when crossing borders within member countries, including data sharing and the use of modern technology for screening drivers under the influence. It should also establish legal measures to control drivers who commit traffic violations in one country and cross borders into other ASEAN member countries, to prevent repeat offenses due to lack of awareness or repeated violations across borders. This is similar to measures enforced in the European Union and Sweden. To prevent cross-border driving while under the influence of psychotropic drugs, ASEAN should support instruments for measuring alcohol and psychotropic drugs at each country's border crossing, potentially avoiding legal issues in each country that determines alcohol and prescribes drug levels differently.

4) Legal harmonization among ASEAN countries: Following the European Union's legal harmonization approach is seen as a good operational model for a region with close relationships, cooperation, and relatively similar levels of development. However, due to differences in legal systems, politics, economies, and societies among ASEAN countries, there are significant variations. While some countries have high stability in various aspects, many others still require development in all areas, including addressing internal issues unique to each country. Therefore, adopting region-level legal measures in the form of Directives, which are characterized as hard laws, may not be suitable for the current ASEAN situation. Hence, convening meetings to gather consensus among member states and leading to the creation of "Resolutions" or "Agreements" as the basis for action, along with using "Recommendations" combined with the preparation of "Final Reports" to fill gaps in details not mentioned in "Resolutions" and "Agreements," seems to be a more appropriate approach for ASEAN. To harmonize national laws, the prospective ASEAN Agreement for the Protection of Driving Under the Influence of Psychotropic Drugs and its Work Plan should be proposed to guide any state member in implementing this "Agreement" in their own countries. Other technical guidelines, such as blood alcohol concentration (BAC) and drug levels prescribed, should also be declared. To support each member's work plan against

drug-driving, ASEAN should add some additional guidelines at multi-levels, such as laws and regulations, policy support instruments, and impaired driving offenders' sanctions.

5) Driver physical examination standards based on ASEAN member countries' laws: ASEAN should monitor each country, particularly during physical examination and drug testing procedures at checkpoints, traffic accident scenes, and while driving, to promote human rights protection among road users. This should be based on medical principles for preliminary testing to help screen traffic offenders and prevent disputes that may arise among drivers who cross borders from countries with high examination standards to countries with lower or no established standards, in accordance with international guidelines. If human rights violations are discovered, the facts should be reported to the UNHRC, and that violated country should be punished.

Conclusion

According to the findings of this study, ASEAN has no direct strategy that can mandate or obligate all state members to support the prevention of driving under the influences. ASEAN has no additional guidelines for controlling psychotropic drug use among drivers. In the case of cross-border driving, the countermeasures to prevent driving under the influence is unclear. Human rights and drug testing should be scrutinized among road users. In summary, ASEAN should have a clear policy on the use of psychotropic drugs while driving. The prospective ASEAN Agreement for the Protection of Driving Under the Influence of Psychotropic Drugs and its Work Plan, and other technical guidelines should be proposed. ASEAN should support instruments for measuring alcohol and psychotropic drugs at each country's border crossing. ASEAN should monitor each country, especially during physical examination and drug testing procedures in accordance with international human rights law. Different measures and policies among the ASEAN members should be investigated further.

Conflict of Interest

The author declares no conflicts of interest.

Author Contributions

Arnon Jumlongkul created all research design, analyzed, and drafted this article solely.

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Physical and Chemical properties of Medical Lubricant Made from Rice Starch

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Abstract:

Background: Gel lubricants belong to pharmaceuticals that are included in the cost of diagnostics. This material is pharmaceutical product in gel form that has been synthesized for medical or veterinary use. It is a lubricant for various body parts for surgery, physical examination, or as a reduced friction agent between the body and medical equipment. Normally, this product must be imported from foreign contries billions baht per year.

Objective: This research aims to produce medical lubricant gel from rice starch, a Thai agricultural raw material that helps reduce the problem of importation from abroad.

Materials and Method: The main raw material is pure rice starch, pharmaceutical grade added in different amounts of 37%, 54%, 63%, 70%, and 80% by weight mixed with additives. These additives are sodium hydroxide, carboxyl-methyl cellulose, sucrose, glycerin, and methylparaben. The method of combining the solution with the solution determines the physicochemical characteristics of commercial lubricant gel, compared with the gel samples of this research by using the SEM-EDS technique, pH analysis, and the FTIR technique.

Results: The results showed that the acidity and alkalinity of the two commercial gels compared to the sample gel. The pH is in the range between can be used according to ISO 13485: 2003 in the same range, pH 6-7. The morphology of the commercial gel found that the lubricant gel from the rice starch was uniformly distributed in the structure of the gel. The viscosity of the commercial lubricant gel is 2,991 ± 60.92 cP. This value is near the viscosity of gel 80 wt% of rice starch was 2,936 ± 18.52 cP. The chemical composition of the commercial gels consists of the carbon and oxygen function groups. However, the FTIR technique found amounts of synthetic substances such as sulfur, chloride, nitrogen, and zinc, which may irritate to skin. Meanwhile, the rice gel of this research found that there are carbon compounds, oxygen, and sodium, which are more than 95% organic compounds, and therefore 100% safe.

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Conclusion: The study of lubricating gel made from rice starch by finding the physical, chemical, and biological properties. This project found that rice lubricant gel contains 80% of rice starch by weight. It is the best ingredient which has the same safety and lubrication performance as a commercial gel. Therefore, lubricant gel from rice starch can replace the gel ordered from abroad.

Keywords: Rice starch, Medical lubricant, Gelatinized, Water soluble, Viscosity.

Introduction

Medical lubricants are substances that physicians or health care practitioners are licensed to use to lubricate and reduce any discomfort to patients during medical and surgical procedures. Examples of lubricant gel that are compatible with surgery consist of K-Y jelly, surgilube, lignocaine gel, and medicinal castor oil.[1] These products are usually water-based gels due to the ease of production, such as scalability mechanical properties, fluidity, and biological properties when used together with general condoms, biological compatibility, user acceptance, and safety in a semi-solid form.[2-6] For other lubricants used in drug delivery systems that are generally available, there are disadvantages, such as products that contain oil. Not compatible with condoms.[7] Silicone products tend to be more expensive than traditional lubricants and the product may contain synthetic substances such as sulfur, zinc, and chloride, therefore may cause skin irritation and be difficult to clean. Starch is one of the world's food sources and remain important to the food industry. There is a variety of modified flour research, such as being able to turn into a gel that is stable by chemical modification. Modified starch was able to increase the shear resistance, resistant to acids and alkalis, and high temperature. Aside from physical modifications, the powder can also be mixed with various additives and plasticizers.[8] In 2023, Thailand was third after Vietnam, and India the world of rice exporter. Thailand produces 6.92 million tons of rice exported.[9] However, rice accounts for only 19.2% of the total export value. Therefore, more research is needed on rice to add value to rice flour. Medical lubricants can be produced with rice starch.[10] The objective of this research is to study the physical and chemical properties of medical lubricants from RS compared with commercial gel for a clinical trial in the future.

Materials and Method

Sample preparation

The preparation of rice starch (RS) gel was based on our earlier work.[10] Glycerol solution (Sigma-Aldrich, 99.5% USP, Germany) 10 ml was blended in 3 ml of distilled water and added to 0.5 g of sucrose (Sigma-Aldrich, 99.5% USP, Germany) to the solution and then heated to 80°C and the mixture was stirred for 15 min. Then, 0.02 g of sodium hydroxide (Fluka, 98%, analytical grade, German) was dissolved in 20 ml of distilled water, heated to 90°C (the optimal gelatinization of RS between 85 and 95°C), and then the RS powder was added 37, 54, 63, 70, 80 wt% and added 0.3 g of carboxyl methylcellulose (Sigma-Aldrich, 99.5% USP, Germany). The mixture was stirred for 20 min until homogeneous. Once both solutions were prepared, the mixture was blended in homogeneous paste at room temperature for 30 min in a beaker on a hotplate and stirrer until the RS gel was

produced. Then, neutralization of the RS gel with pH = 7. The RS gel was mixed with 0.02 g of methylparaben (Sigma-Aldrich, reagent grade, 95%, Germany), and then the gel was stirred for 10 min until mixed well. The prepared RS gels were taken in a dried oven at 55°C for 24 hours.

Characterization

SEM-EDS

SEM (JSM-6335F, JEOL, Tokyo, Japan) Energy dispersive spectroscopy (EDS) was used to analyze the morphology of commercial and rice starch gels.

Viscosity

Viscosity properties of the samples were studied, using a suspension viscometer (DV-III+, Brookfield), needle No. 29, temperature 31-35°C, and speed +20 rpm up to 9 points. Viscosity model was measured by the following eqation: $\sigma = \sigma_0 + \eta_B \dot{\gamma}$, where σ is shear stress, σ_0 is the yield stress, η_B is the plastic viscosity of the samples, and $\dot{\gamma}$ is shear rate. All measurements were repeated five times and the mean value was taken.

pH Values

The determination of pH values of the samples was carried out using a waterproof pH spear tester (Oakton pH Spear Waterproof Pocket Tester EW-35634-40-Pro, Singapore). Measured ranges were from -1 to 15, with a resolution of 0.01 and accuracy was +0.01. Measurement of temperatures ranged from 0 to 50°C.

FTIR analysis

The FTIR spectra of composite samples were analyzed using a Nicolet 6700 FTIR spectrometer (Thermo Fisher Scientific Inc., Warsaw, Poland) instrument in attenuated total reflectance (ATR) mode. The samples were mixed with KBr powder at a ratio of 1:150 (w/w). Spectra were scanned from 4000 to 500 cm^{-1} with 32 sample/background scans at a resolution of 4 cm^{-1}, 8 sample gain, and 0.6329 optical velocity and a 100 aperture.

Statistical analysis

All quantitative data were analyzed with origin 8.0 (Origin Lab Corporation, USA) and presented as the mean ± standard deviation. Statistical comparisons were carried out using analysis of variance (ANOVA, Origin 8.0). A value of $p < 0.05$ was considered to be statistically significant.

Results and Discussion

The morphology of the surface of various compositions RS gel was compared with commercial gel. Figure 1 shows that the surface of commercial gel is smooth and does not see any particles that are dispersed between gel structures which is different from RS gel. It showed that commercial gel may have more gel flow ability than RS gel because the SEM image showed the strength of the gel (Observed from the surface of no cracks) with regular between the surfaces of the gel as shown in Figure 1. Meanwhile, RS gel was less strong, due to observing the widely cracking between gel surface and the 5-6 micron rice powder particles are even distributed within the gel structure were shown in Figure 2-6. It is assumed that the RS powder will be effective in increasing the viscosity control overall flow ability and increase gel stability.

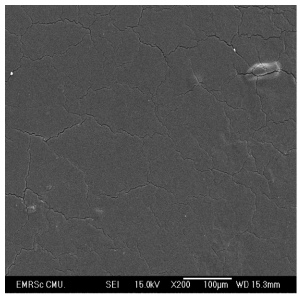


Figure 1 Commercial gel

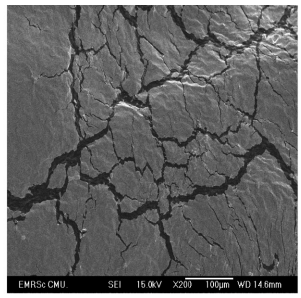


Figure 2 37% RS

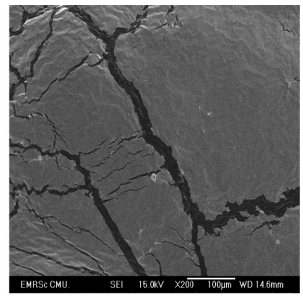


Figure 3 54% RS

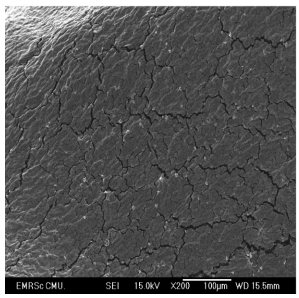


Figure 4 63% RS

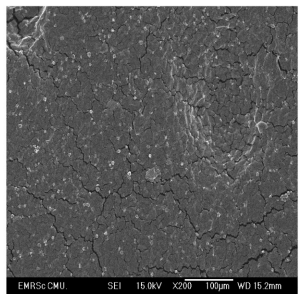


Figure 5 70% RS

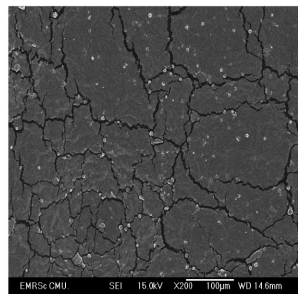
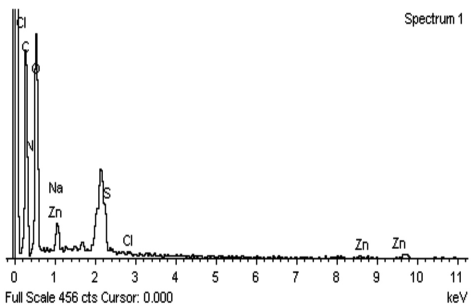


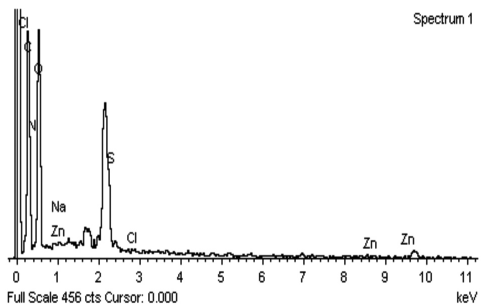
Figure 6 80% RS

Figure 7 shows the chemical composition of commercial gel with the EDS technique found that commercial gel contains carbon atoms 46.48%, oxygen 47.95%, nitrogen 2.62%, sodium 1.81%, sulfur 0.94%, zinc 0.10% and chloride 0.10%, respectively. RS gel (80% RS) found 56.64% carbon atoms, 51.36% oxygen, and 0.17% sodium, which indicated that commercial gel and RS gel had the main ingredient substance of hydrocarbons. There is a high amount of carbon and oxygen. However, RS gel did not find toxic substances in the group of synthetic substances such as sulfur, zinc, chloride, and nitrogen, which are these substances may irritate. Thus, RS gel is safer and more environmentally friendly (Figure 7 and 8).



Element	Weight%	Atomic%
C K	43.44	46.48
N K	2.61	2.62
O K	48.13	47.95
Na K	2.96	1.81
S K	2.14	0.94
Cl K	0.24	0.10
Zn K	0.48	0.10
Totals	100.00	

Figure 7 Commercial gel



Element	Weight%	Atomic%
C K	48.01	56.64
N K	-6.49	-6.43
O K	62.62	51.36
Na K	0.27	0.17
S K	-3.50	-1.51
Cl K	-0.17	-0.07
Zn K	-0.74	-0.16
Totals	100.00	

Figure 8 80% RS

Table 1 shows a comparison of pH values and viscosity values of commercial gel and RS gel. The measurement of pH commercial gel and RS gel found that the pH values both were in the same range between 7.02-7.09. These ranges indicated that its neutral values can be used without irritating human skin. For RS gel, it was found that 37wt% to 80wt% of RS powder had the rheology property as a Bingham plastic. This was due to the maximum shear stress being different because all formulas must use the maximum shear stress equal to the yield stress to flow which was behavior similar to commercial lubricants, and from the data on the viscosity of all gels, 80wt% RS powder. The viscosity nearly value to commercial gel is 2,936 ±18.52 cP (Table 1).

Table 1 pH and viscosity values of commercial gel and different RS gel

Type	pH	Viscosity [cP]
Commercial gel	7.06 ± 0.06	2,991 ± 60.92
37% RS	7.06 ± 0.06	342.77 ± 3.87
54% RS	7.02 ± 0.02	972.80 ± 7.88
63% RS	7.09 ± 0.07	1,865 ± 14.42
70% RS	7.05 ± 0.10	1,059.67 ± 9.61
80% RS	7.06 ± 0.06	2,936 ± 18.52

Figure 9 and Table 2 illustrate that the spectra of commercial gel are OH-group at position 3280 cm^{-1}, which is the elongation mode of water and glycerol. As well as RS gel adds on 37 wt% to 80 wt% RS powder at positions 3265, 3266, 3267, 3279, and 3278 cm^{-1}, respectively. The commercial gel found the functional groups of nitrogen position at 1644 cm^{-1} and ethylene glycol at 1456 cm^{-1} and the sucrose group at 1353 cm^{-1} and the sulfur group at 506 cm^{-1} and ethanol, which shows that there are groups of compounds that may cause tissue toxicity. Apart from this, RS gel had an OH group of water and glycerol in a high quantity. The compound is found in the carbonyl group and carboxylic groups at positions 1652, 1653, 1650, 1595, and 1652 cm^{-1}, respectively. These substances were obtained from carboxyl methylcellulose and some organic acids to neutralize the acid-base values and found the sucrose group at 1152 cm^{-1} and the carbohydrate group -CH2OH at 1026 to 1029 cm^{-1}.[11]

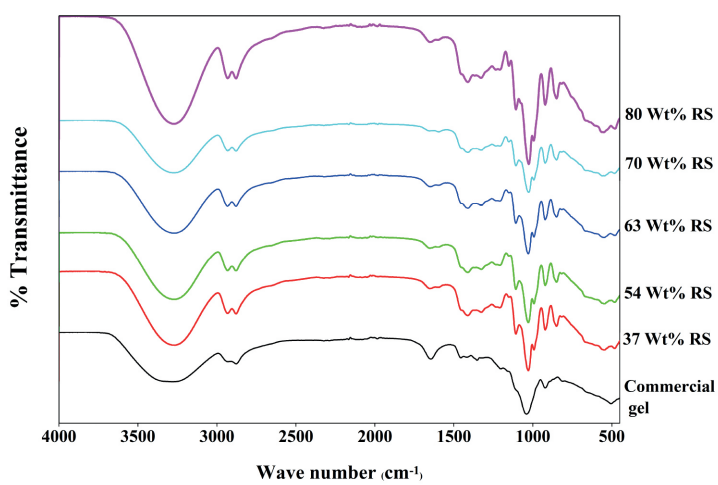


Figure 9 FTIR spectra of commercial gel and different RS gel

Table 2 Interpertation of IR spectra of commercial gel and different RS gel

Wave number (cm^{-1})						Functional groups /assignment
Commercial gel	37% RS	54% RS	63% RS	70% RS	80% RS	
3280	3265	3266	3267	3279	3278	Stretching O-H symmetric, OH water
-	2931	2932	2933	2931	2931	CH_2 antisymmetric stretch
2878	2878	2879	2879	2879	2879	CH_2 symmetric stretch
-	1652	1653	1650	1595	1652	carboxyl group
1644	-	-	-	-	-	Amide II: (protein N-H stretching)
1456	-	-	-	-	-	(CH_2 bending) of ethylene glycol
-	1412	1413	1412	1412	1412	(CH_2 bending) of glycerol
1353	-	-	-	-	-	CH_2 wagging of sucrose
-	1209	1209	1209	1209	1209	C-C-C, C-O-C stretch of glycerol
-	-	-	-	1152	1152	C-C-C, C-O-C stretch of sucrose
-	1107	1108	1108	1107	1107	C-O stretch of glycerol
1041	-	-	-	-	-	CO-O-CO stretching
-	1029	1029	1029	1027	1026	Vibrational frequency of -CH_2OH groups of carbohydrates (including glucose, fructose, glycogen, etc.)
-	992	993	993	994	994	C-OH stretch of glycerol
922	921	922	922	922	922	C-OH stretch of glycerol
	850	850	850	850	850	Aromatic C-H out-of-plane bend
-	547	548	549	561	551	Out-of-plane C=O bending
506	-	-	-	-	-	(S-S stretch)

Summary

Medical lubricants made from rice starch showed morphology, chemical composition, pH, viscosity, and functional groups compared with commercial lubricants. The optimization condition of RS gel of 80 wt% rice starch showed the appropriate condition of physical cross-linking used for substitute medical lubricants from foreign due to physical and chemical properties close to commercial. RS gel is safe, water-soluble, and low-cost. This research should be further studied in a clinical trial.

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Video Creative Musical Based Tutorial as a Media to Enhance Students Socioemotional Well-Being

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Abstract:

Background: The concept of independence in learning has been widely recognized as a fundamental aspect of national education. It presents new problems and paradigms that are believed to require a significant amount of time to fully develop students' ability to think critically and autonomously, both for their own benefit and for the betterment of society.

Objective: To study effect of creative music learning with video tutorials on emotional well-being of primary school music students.

Materials and Method: We measure student self-efficacy through musically creative video training. Immersive, adaptable, and culturally-rooted sounds excite kids. With more digital media, kids can cope with globalization. Communication boosts learning and engagement. This channel helps kids learn at home. E-learning is beneficial for remote COVID-19 learners. Media-based distance learning is self-paced and instructor-free. Teachers, parents, and students must work together at home and school. Without academics, distance education employs technology, information, and media. In video tutorials, audiovisual elements can enhance teacher-student online learning. The lack of creativity among primary school music teachers has negatively impacted this. This study employs art-based mixed-methods research. Using a quasi-experimental approach, questionnaires collect quantitative data. Additionally, we use focus group summaries as secondary qualitative data.

Results: The treatment group had a self-efficacy score of 0.49, with an average of 0.91, compared to the control group's 0.95, with an average of 0.85. A 2-tailed significance value of 0.05 or above demonstrates that creative music learning through video lessons affects the experimental group. The focus group discussions with students' parents and teachers showed that multimedia made the video tutorial learning approach more successful and enjoyable.

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Conclusion: Creative and engaging online music learning resources may improve and broaden the paradigm. Creative music learning with video tutorials may be a viable alternative and increase primary school music students' emotional well-being.

Keywords: Emotional Well-Being, Explorative, Creative, Video Tutorial, Art-Based

Introduction

People widely recognize the concept of independence in learning as a fundamental aspect of national education. It presents new problems and paradigms that are believed to require a significant amount of time to fully develop students' ability to think critically and autonomously, both for their own benefit and for the betterment of society. Furthermore, the core aspect of independence is the freedom to engage in critical thinking within the educational process for both educators and learners.[1-3] This is especially true since the COVID-19 epidemic has escalated into a health crisis due to its high transmission rate, resulting in the closure of schools in over 150 countries and impacting almost 1 billion children.[4] Indonesia, along with other countries, has implemented more social constraints, resulting in a rise in psychological distress owing to the shift to remote and online learning. However, this transition has not been successful in providing high-quality education, as seen in Brazil, where teachers lack familiarity with internet tools, leading to a reduction in learning outcomes.[5,6]

In this scenario, music can successfully handle issues such as self-preservation, ingenuity, critical thinking, and emotional reactions.[7] Consequently, despite the lack of current implementation, schools require musical literacy. The underlying reasons for difficulties in music education, both in the past and now, remain consistent: inadequate teachers, students, resources, and curriculum.[8,9] Humanistic education has traditionally viewed music as a skill rather than a medium.[10] Teachers' lack of comprehension and proficiency is believed to result in a mismatch between students' learning and their surroundings and requirements. This is particularly concerning, as there is currently no comprehensive model of musical creativity activities that is based on the study of musical elements.[11]

Concurrently, recent technological advancements and the widespread use of the internet have revolutionized the methods of acquiring knowledge, consuming audio content, creating music, and instructing others in the field of music. Music instructors commonly use digital devices to enhance learning, but there hasn't been much research on the use of video in music education. According to YouTube data, individuals worldwide stream and view over one billion hours of video content with significant commercial value on a daily basis. Online platforms, such as tutorials and music courses, have gained significant popularity because they can provide attractive content by downloading numerous videos. Instructors believe that using videos is highly pleasurable, particularly for elementary school children, and it elicits greater enthusiasm from them.[12-15]

Implementing entertaining learning tactics is one effective way for children to cultivate their musical aptitude as a foundation for self-confidence. Not only do educational resources align with children's cognitive growth, but they also integrate regional cultural expressions. This research aims to create a model of musical creativity that stems from the unconventional thinking experiences of children. This research

provides youngsters with the chance to cultivate their potential from a young age while maintaining their cultural identity. As a result, we anticipate that they will be better prepared to nurture their creativity in the future. Furthermore, this study aims to enlighten parents and educators, enabling them to effectively mentor youngsters in a more innovative manner, both within and outside of the educational institution. By incorporating the cognitive, emotive, and motor experiences of children, the video tutorial aims to reflect the fundamental aspects of music, including creativity, adaptability, exploration, and integration.

This study is crucial for exploring a new approach to music education that emphasizes the direct experiential understanding of sound aesthetics for both students and teachers. There is an expectation that the youngster will demonstrate a shift in their creative behavior and develop a sense of confidence in their ability to navigate everyday situations. Developing critical thinking skills is essential for future success because it is required to generate prosperity through innovative and quantifiable means.

Materials and Method

Research Design

In this research, one group pre-test-post-test design Only form will be used to obtain actual information estimates as a systematic method of building a cause-and-effect relationship.

Table 1 Research Design

Group	Pretest	Treatment	Posttest
Experiment	O_1	X_1	O_2
Control	O_1	X_0	O_2

In this study, the independent variable is the implementation of the musical creativity model, while the dependent variable is the evaluation of children's self-efficacy, which will be assessed through pretest and posttest measurements. The control variables, which are held constant, include the teacher, the allocated time for instruction, and the material utilized during the study, which will be centred on aspects such as originality, improvisation, fluency, and composition.

Participants

The subjects were students and teachers, with a target of N=150 (students) in grades 4-5 and N=12 (teachers) in the elementary school. The average of students' age = 10 ± 0.742 and the average of teachers' age = 46.25 ± 5.63. The sampling technique used was cluster random sampling of the group used for the experiment and control. The result of the random selection of 150 students determined the experimental group to be in Class A (male=37, female=38) and Class B (male=35, female=40) as the control group.

Stimuli and Procedure

The students in the experimental group were involved in a creative teaching model for three months. The creative teaching model emphasises the role of children as the main actors in the learning process and the sensibility of the teacher to facilitate the students. The students were given the freedom to explore their daily cultural activity and to process it into a performance. An essential approach that was maintained

during the process is the omission of children's active behaviour to ensure their confidence and comfort during the exploration. At the of the activity, their performance was recorded in the form of a creative video as learning materials to be watched by the teachers, students, and the parents at home. Meanwhile, the control group received no intentional creative process as the one that happened in the experimental group. The control group stayed with the conventional teaching method that used to be applied in the classroom.

Materials

A questionnaire was developed based on the construct of self-efficacy to measure the dependent variable. This questionnaire consists of 20 items with statements such as *"I feel encouraged during the music lesson"* and *"I feel I am good enough in contributing for the lesson"*. The reliability test of the questionnaire showed a sound result with Cronbach's alpha = .890. Based on the raters' agreement, the validity of the questionnaire showed S-CVI=.880, with all I-CVI above =.79. Meanwhile, the corrected item-total correlation of all questionnaire's items showed the $R_{it} > .25$ as the critical value of df=19 so that all items statistically fulfil the requirement to discriminate and measure the research variables.

Statistical Analysis

The descriptive statistics analysis is used to obtain the data summary of participants' demography. Meanwhile, the inferential statistic analysis is used to conclude the relationship of variables among the population. The data of both control and experiment group were tested for normality using Shapiro-Wilk test and the homogeneity of the data in both groups was tested using Levene statistic focusing on homogeneity based on the means. To ensure the linearity of the pretest and post test in both experiment and contorl group, the ANOVA was conducted to find the significance of linearity deviation. Meanwhile, hypothesis testing was conducted using paired t-test statistics through the SPSS licensed to Mae Fah Luang University which $p < 0.05$ was set as the minimum level of statistical significance.

Results

The data showed no statistical significant difference between participants' age ($t = -.052$; $p = 0.661$) and family income ($t = -5600.00$; $p = 0.918$) in both control and experiment groups. These initial conditions indicate the limited potential for age and economic differences to affect the research outcomes. The normality test showed that all data were normally distributed both in the experiment and control group where all p-values > .05. The Levene's homogeneity test also showed the homogeneity of data by showing all p-values > .05, indicating the subjects in both control and experiment group to be from a similar population. ANOVA focused on the deviation from linearity to ensure the linearity of pre-test and post-test scores showed that the p-value was bigger than alpha (.184 > .05) which showed insignificant deviation from linearity in both control and experiment groups. Thus, the pre-and post-test scores of both groups in this research are linear, and the causative relation makes sense.

The paired t-test indicates a difference in the average of each treatment. The average value in the experimental group was 0.914 (±1.32) and the average value in the control group was 0.085 (±1.43). These average values indicated the existence of differences in the impact of the treatment in each group implying that the experimental group was larger than the control group. It also can be seen in the t coefficient of both group that indicating the raise of posttest score is higher in experimental group (t = .693) than in

control group (t = .060). The pretest and posttest score in both experimental and control groups showed a positive correlation relationship as seen from the correlation numbers of 0.811 and 0.750, respectively. This correlational relationship is statistically significant at $p < 0.05$ (see Table 2).

Table 2 shows correlation of pretest and posttest in both groups

	mean	SEM	t	df	*p*-value
Pretest Experiment - Posttest Experiment	.914	1.32	.69	46	.492
Pretest Control - Posttest Control	.085	1.43	.06	46	.953

FGD data summary

The FGD was conducted for teachers and students that actively involved in the creative learning process and those who were watching the final video result. The analysis of this data emerged some important themes and key points regarding the effect of both the creative learning process and watching the video. First, the experience of storytelling. The students had never been asked about their experience before by any other music teacher and this experience led them to feel the importance of their role in the learning process. The experience of discussion was also marked as an essential event as they tended to feel something novel and unfamiliar when their experience was being discussed and seen as important to the teaching materials. It is said, *"It was interesting that my personal experience was discussed in the class as a learning material"*. The next highlight is the experience of finding a theme for a song based on the students' experience. For most of the students, their experience might occur as an event that is sometimes unable to be reflected nor to be articulated well. During the creative learning process, most of the students didn't even imagine that their life experience had the potential to be the theme of a song and performance, *"I never thought that it is possible to create a song based on my daily experience. It is surprising in a unique way"*

As the three main points above highlight the feelings of importance that showed in the students due to the recognition of their experiences, the fourth and the fifth points brought the idea of a learning experience that hadn't been perceived before to write their own lyrics and to collaborate with the teacher in a proportional manner. To be able to write their own lyrics in a confident manner is not an easy thing for some students. Not every student was used to articulating their idea in the form of writing especially the lyrics of a song. Since their experience was discussed as an essential part of the learning and they were encouraged to be comfortable with their identity, the step of lyrics writing became more precious and made them immerse deeply. This point is highlighted in FGD by some students that able to write lyrics on their own makes them feel proud and happy. It can be seen in an interview where the subject said, *"It is amazing that I can write my own lyrics, freely, and it's okay to have some mistakes. No pressure, I just feel happy to do so"*.

Meanwhile, the idea of collaboration was recognised by both students and teachers to be a delightful phase due to the fact that both of them gained insightful ideas during the collaboration. The collaboration in practice, experiments, and group discussion was thought to be less boring than a merely theoretical explanation as a one-directional

lecturing. *"I think this type of lecture gave a lot of insight for everyone as well for me as a teacher. There were so many surprises and new experiences that are enjoyable"*. From all the key points of FGD data, it might be shown the potential that this creative process owns to foster and emerge self-efficacy in students due to their feeling of contribution and importance in the lecture process. Further, watching the video of their performance at home with the parents gave the students a sense of pride and a sense of belonging toward the overall process.

Discussion

The objective of this study is to determine the impact of a music learning paradigm that incorporates creative video creation on the self-efficacy of youngsters. According to the findings, music education via creative video creation and including children in the process has a beneficial impact on children's self-efficacy, even when done at home with parental support. Likewise, when music education is conducted solely in schools with a one-way approach, it frequently leads to heightened discomfort among students, a lack of available teachers, and appears to be emotionally engaging but does not result in a major decrease. The findings from the FGD indicate that the direct instruction of the music subject appears dull in comparison to video production. This finding emphasizes the significance of including creative elements into the development of educational aids for children, with the aim of enhancing their emotional well-being. It provides empirical evidence in support of the research hypothesis.

The umbrella of this research is art-based research, which encompasses methodological and epistemological approaches with various data collection and analysis tools. It also serves as a qualitative data[16] enrichment and investigates musical creativity processes through the concepts and practices of aortography.[17] Because one of its characteristics involves the understanding of discourse, musical activities are understood as a developing process and will be complemented with participatory action research, especially for its expression.[18] This research directly involves the subjects in musical creativity and is often referred[19] to as "real-world research that adopts and uses a critical approach with a focus on improving human life." In addition to the quasi-experimental approach, the research is also equipped with a summary of qualitative data from FGD of students, teachers, and parents.

The empirical analysis of this research shows that video tutorials have a positive effect on self-efficacy that affects the results of the emotional comfort of children, including reducing the experience of depression, hopelessness, powerlessness, and insignificance. Children from low-income families are more likely to suffer from emotional problems. This shows the importance of protecting the emotional comfort and psychological health of children both inside and outside of school through music education. In this case, it becomes even more important for teachers in schools to always experiment creatively and always strive to prepare their teaching techniques well if they are teaching in school. Furthermore, the results of the research show that age is also a protective factor. Older children experience fewer emotional problems, experience more positive and negative life events, interact more with parents in facing difficulties, and gain more knowledge and information from their family, school, or community. They also have better access to resources and support from their environment. Therefore, it is necessary to consider age as a factor in designing music learning models that prioritize the emotional comfort of children.

Historically, creative humans have used stones and wood to develop tools of life, and today digital technology is important in facilitating life.[20] All of this is not disconnected from at least because at an early age, a child's natural potential to think creatively is very high.[21] Then, creativity is an important element of pedagogy, especially in playing, art, and skills in a pleasant environment, so many empirical and theoretical things also increase other competencies, such as language and social skills.[22] In particular, according to the Convention on the Rights of the Child, the child's perspective must be considered because learning while playing will increase creativity.[23]

Creativity is an interaction between an individual and the environment that requires autonomy and structured space.[24] There must be a balance between autonomy and control in creative activities, especially when a child's involvement always takes place in the proximal development zone.[25] Meanwhile, creativity involves many concepts of experience, thinking, or consciousness that can be analyzed using natural science instruments. Cognitive research also includes dynamics and reports the results of the creative process.[26-27] However, there is still a lack of evidence of cognitive approaches in pedagogical practices used to teach creative skills.[28] Some empirical approaches have been developed in the study of creativity of convergent and divergent thinking abilities, which are understood as the task of "using alternatives." The task requires experimental subjects to understand the consequences of a situation, complete what already exists, perform abstract tasks, or produce creative metaphors. Divergent thinking performance is usually evaluated through both quantitative and qualitative aspects.[29-30] Although the role of control in creative performance sometimes finds controlled, directed and non-spontaneous processes.[31-33]

Internal focus that is irrelevant and has internal signs of neurophysiological changes through changes in behavior as a manifestation of the difference between perception and product.[34] On the other hand, auditory learning can be accurate if it is associated with lower alpha power and little internal focus when performing automatic procedures.[34] Thus, creative personality is correlated with a high openness to new experiences and intrinsic motivation to engage in creative behaviour.[35] Creative categorization includes domains, literature, music, visual arts, performance, cuisine, humor, architecture, even business, sports, science, or other social contexts.[36-37]

Practicing music is also highly sought after by researchers, especially due to the nature and creative potential involved with it, and results in interdisciplinary contributions between musicology, cognitive (neuro), sociological, and psychological. And music is one of the popular domains in the inventory of creative achievement through aesthetic products that integrate both intrinsic and familiarity factors, such as (i) creative products and (ii) the creative process. Qualitative study data shows that Western classical composers are very aware of relational dynamics when they are involved in their "solitude."[38] Nevertheless, adaptation remains a fundamental aspect that is based on cognitive science and has yet to see mental activity as a organism-environment specific process.[39-40] This two-way sustained dependence is similar to fulfilling nutrition and various adaptations include different situations and experiences including music.[41]

Creative dynamics are built through direct interaction (when playing music), or through involvement in agreed-upon norms and conventions. This shows the boundaries of distinguishing oneself from others in order to achieve something through renegotiating.[42] In musical terms, creativity

involves deliberately "playing" with the continuous integration of various dynamics so that each product is unique by transcending the boundaries between control, risk, contextuality, and spontaneity. Creative activities involve a lot of intersubjectivity with the presence of others who need emotional and behavioural control.[43]

In line with the growing concept of creativity with many new experiences from practitioners' understanding of the phenomenon. Thus, any effort to find out about creativity will be more beneficial if it takes into account the views of people who have experience in the related domain. Specifically, artists are often considered reliable informants about the nature and progress of their own creativity.[44] While creativity research through psychometric methods is often biased towards reporting rather than a broader structure of thinking. For example, there are many misconceptions that creativity is synonymous with art[45] - only evaluating one questionnaire item. Similarly, methods that use free association tend to produce lists of creativity characteristics with labels such as "beautiful", "curious", and "original."[46] Some music creativity research takes place in disciplines separate from the general theory of creativity, for example, viewing creativity too cognitively and therefore less accurately explaining individual innovation. While creativity research in the field of ethnomusicology tends to be limited by social-anthropological theories[47] which differ from the universalization and cultural concepts.[48] This raise concerns that the mainstream creativity approach is too individualistic, mentalistic, or product-oriented.[49-50] Of all these models, it implies that becoming creative can be enjoyable and can help enhance goals in various ways. This need can be met through production and activities that may not be seen as creative, but that have the potential to enhance one's overall sense of wellbeing, including the arts and humanities, social sciences, and natural sciences.[51]

One of the affective keys, non-academic factors related to student satisfaction and perseverance in online or retention in online programs is motivation, specifically, self-determined motivation and self-efficacy.[52] Furthermore, children today are faced with rapid sensory experiences, such as advanced video games, making it highly likely that they reject traditional worksheets such as traditional paper and pencil in class.[53] Above all, good mental and emotional health enables children to develop flexibility in coping with the problems that occur in their lives. In addition, currently there are various and many peer pressures, the influence of social media, thrilling video games, internet and video game addiction, etc. Therefore, to avoid such a situation, it is very important to instill appropriate music skills in children from an early age, so that they learn to maintain their emotional comfort. Because children get bored, the level of worry and disruptive behavior will increase. So, the choice for safe activities (such as art, music, games) and involving children in brainstorming other creative ideas.[54] In learning activities there is also a factor of depression and even "chronic stress associated with pressure to succeed in school, family instability, fatigue, lack of sleep, low self-esteem or self-confidence, and poor social relationships with peers, parents and teachers."[55] Meanwhile, social, and emotional skills can be nurtured by forming close and safe relationships with parents or teachers through programs to develop them in school. Relationships not only help to increase children's stable social and emotional skills, but also become a protective factor or compensation when faced with emotional challenges.[56] It's time for teachers to give children the opportunity to learn about discourse outside of their

abilities or interests in order to not reinforce their social abilities. Through the experience of the pandemic, a global scientific community union was also created, allowing for collaboration and partnership to solve problems together, so that the humanities, social sciences, and natural sciences can help each other.[57] The need to bring meaning, find purpose in uncertain situations, and solve innovative and creative problems is necessary to deal with societal crisis.[58] Furthermore, findings show that in existential crises like this, creativity can not only be improved but can also give birth to new things.[59] Because the psychological consequences of the pandemic are a major disaster, including anxiety, depression effects, insomnia, and fear around the world.[60-63]

In recent decades, technological advances have also occurred in various fields, significantly integrating video as one of the most important media to enhance academic performance.[64] The practical use of video is irreplaceable in distance learning situations, and even since 2005 when the YouTube platform was created, it has become one of the most widely used sources in education.[65] This contribution has made students more likely to choose video use in learning, as it is more interactive and makes learning more fun and easier.[66] The use of video in learning is a promising field for innovation and creativity, providing students with a wider range of learning materials, multimedia features and different perspectives.[67] However, the use of video in learning also requires careful attention to quality and relevance, as well as the impact it can have on student learning outcomes.[68-70]

Then the age factor of teachers with high education levels is more likely to use technology. A crucial variable in using videos is short duration but high impact[71-72] especially the effect of edutubers (creators of audiovisual content).[73] Research results acknowledge the reliability, accuracy, and credibility of the content[74] and the success factors of videos such as how to explain and display images[75], including arrangement and editing.[76] The contribution of video literacy in education shows that students prefer the use of videos[77] as part of their learning[78-81] and have a positive level of satisfaction because they are able to explain concepts through contextual examples[82] besides having an impact on time management and discipline[83] compared to face-to-face interactions. Therefore, it is expected that teaching models through videos containing important components of social competence such as skills, adaptation, and social performance to improve the relationship between competence and social adaptation can enhance prosocial behavior and social participation.[84] Thus, in the future, the effectiveness of music education programs directly and through video tutorials must be considered to help teachers identify early signs and symptoms in improving the mental and emotional health of children.[85]

Conclusion

Therefore, we can infer that each group displays distinct behavior. Both groups had a positive association with the treatment they got. Both groups exhibit a favorable effect following the administration of the medication; however, the effect is more pronounced in the experimental group in comparison to the control group. The positive impact mentioned here pertains to the youngster experiencing a heightened state of relaxation, free from tension, and being able to acquire musical skills through video tutorials that incorporate animated demonstrations and visual guidance from the instructor. Therefore, we can improve and extend the use of video tutorials in the future, especially to enhance the enjoyment of music education for children in areas where music teachers are scarce.

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Contribution

Conceptualization: Djohan and Fortunata; Methodology: Henry Yuda Oktadus and Indra K. Wardani; Formal analysis: Djohan; Investigation: Djohan, and Fortunata, F. Tyasrinestu, and Asep Hidayat; Writing-original draft preparation: Djohan, and Phakkharawat Sittiprapaporn; Writing-review and editing, Phakkharawat Sittiprapaporn; Project administration: Djohan, and Phakkharawat Sittiprapaporn. All authors have read and agreed to the published version of the manuscript.

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Case Report

GMSMJ

Greater Mekong Subregion Medical Journal

Successful Management of a Foramen Magnum Meningioma that Presented as Recurrent Aspiration Pneumonia and was Associated with COVID-19 Pneumonia with Obstructive Sleep Apnea: A Case Report.

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Abstract:

Foramen magnum meningiomas (FMMs) are rare and challenging tumors. We report a case of foramen magnum meningioma in a 49-year-old female who presented with obstructive sleep apnea and suffered from recurrent aspiration pneumonia. She tested positive for COVID-19. A magnetic resonance image (MRI) revealed a ventral foramen magnum mass lesion that measured 33 mm in diameter, causing a significant pressure effect on the medulla oblongata. After her pneumonia improved, a far lateral retrocondylar approach provided a safe surgical plane for the total excision of this tumor. The pathologic analysis revealed a WHO-grade-I meningioma. Rarely, FMM-compressed medulla oblongata can present with obstructive sleep apnea and recurrent aspiration pneumonia. We successfully removed the entire FMM, resolving her obstructive sleep apnea and recurrent aspiration pneumonia.

Keywords: Foramen magnum, meningioma, Obstructive sleep apnea, Recurrent aspiration pneumonia, COVID-19

Introduction

Foramen magnum meningiomas (FMMs) are rare and challenging tumors. These lesions are skull-based meningiomas, which account for 1.8-3.2% of all meningiomas.[1] Managing FMMs is difficult because they are closely related anatomically to essential structures in a narrow space and critical neurovascular structures such as the brainstem, the lower cranial nerves, and the vertebrobasilar system. FMMs are typically slow-growing with an indolent course, which makes clinical diagnosis complex and often leads to a long interval between the onset of symptoms and diagnosis.[2] FMMs rarely present with respiratory disturbances.[3] They most commonly present with quadriparesis, sensory abnormalities, ataxia, and dysfunction of cranial nerves (CN) IX, X, and XI. Terminal progression includes inability to maintain airway protection with secondary pneumonitis and ultimately respiratory arrest.[2-5] Breathing and swallowing are tightly coupled and are well-controlled by the interaction of neuronal groups co-localized in the medulla oblongata.[6,7] Disruption of breathing-swallowing coordination causes

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aspiration, facilitating repeated pulmonary complications, leading to and including lower respiratory tract infections.[8] Since December 2019, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has become a worldwide pandemic. The SARS-CoV-2 virus causes coronavirus disease (COVID-19), which is an infectious disease that can range from asymptomatic to life-threatening pneumonia. During this pandemic, it was difficult to differentially diagnose pneumonia, which is caused by the aspiration of different materials and SARS-CoV-2.[9]

This report aims to document a rare case of an FMM patient who experienced recurrent aspiration pneumonia, obstructive sleep apnea, and COVID-19 during this visit. We obtained data from outpatient records, surgical reports, inpatient flow charts, and discharge summaries. We obtained the data in January 2022. This report has the patient's informed consent and the ethics committee approval of Phayao Hospital (COA no. 211, PYHREC no. 33/2566).

Case presentation

The patient was a 49-year-old Thai housewife, who presented with fever, productive cough, and shortness of breath one day prior to admission. Eighteen months ago, she was diagnosed with obesity and obstructive sleep apnea (OSA). She has been receiving OSA treatment using continuous positive airway pressure (CPAP) at night, with a pressure range of 8-12 cmH_2O. The individual had a body mass index (BMI) of 33 kg/m^2, with a weight of 85 kg and a height of 159 cm. She experienced occipital headaches and found relief with analgesic medication. In addition, she suffered from repeated episodes of aspiration pneumonia and respiratory failure, which led to her requiring ventilator support on five occasions during hospitalization over the past 18 months. Because of experiencing dysphagia, hoarseness, and a notable weight loss of 6 kg over the past 6 months, the patient underwent a thorough examination including esophagogastroduodenoscopies (EGD), a fiber optic laryngoscope (FOL), and barium swallow evaluations, all of which yielded normal results. Her last admission occurred one month ago; this was due to development of respiratory failure. In addition, she experienced neurological symptoms such as fatigue, ataxia, numbness in all extremities from the neck down, and urinary incontinence. She was nearly bedridden, with a nasogastric tube (NG tube) and a urinary catheter in place until she was discharged, pending a full evaluation of her myelopathy. She was in respiratory distress with a respiratory rate of 40 per minute, oxygen saturation of 89% in room air, a temperature of 38.8°C, a pulse rate of 132 beats per minute, and a blood pressure of 132/74 mmHg. Coarse crepitations were heard bilaterally in the lung fields on inspiration, and the heart sounds were normal. Her mental status was intact; there was no meningeal sign. There was no gag reflex. In all extremities, motor and sensory examinations revealed quadriplegia and hypoesthesia below the posterior neck, as well as hyperreflexia of the deep tendons. Hoffmann's sign was positive on both hands. On both sides, Babinski's signs and ankle clonus were positive.

The chest radiography revealed airspace opacities in bilateral lung fields, more pronounced in the right perihilar regions (Figure 1). The blood gas analysis revealed respiratory failure. The COVID-19 rapid antigen test conducted on a sample taken from the nasopharynx showed a positive result. She had received a booster shot of the Pfizer-BioNTech mRNA vaccine 12 months ago. We assessed her for severe COVID-19 pneumonia. Due to COVID-19, we hospitalized her in the intensive care unit. The patient underwent intubation and received meropenem 1 gm intravenously

every 8 hours for 14 days as an empirical treatment for aspiration pneumonia. Additionally, we treated her for COVID-19 by administering molnupiravir 800 mg via a NG tube every 12 hours for 5 days. We also administered intravenous dexamethasone, gradually lowering the dosage over an 11-day period based on the patient's improved symptoms. The initial dosage was dexamethasone 4 mg intravenously every 6 hours for 2 days, followed by every 8 hours for 2 days, then every 12 hours for 2 days, and finally every 24 hours for 5 days. She had a favorable response to the treatment. On the ninth day following admission, we were able to remove the mechanical respirator and endotracheal tube. The clinical and chest radiography had shown improvement (Figure 2). The bacterial cultures, such as hemoculture, sputum culture, and urine culture revealed no evidence of bacterial proliferation.

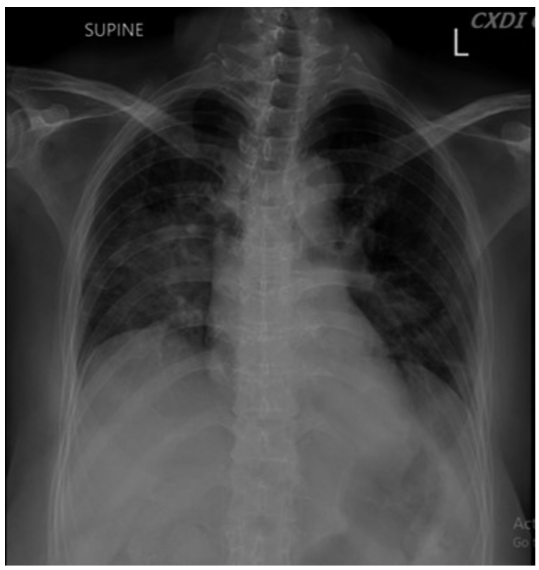

Figure 1 The chest radiography revealed air space opacities in bilateral lung fields, more pronounced in the right perihilar regions.

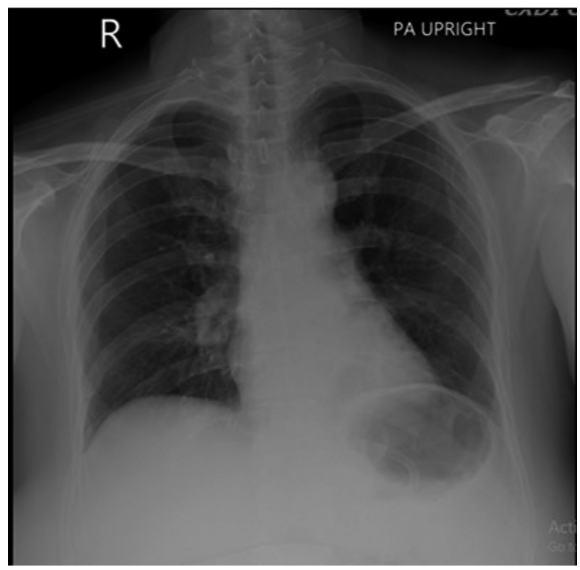

Figure 2 The chest radiography revealed improved lung fields, a response to treatment and resolved pneumonia.

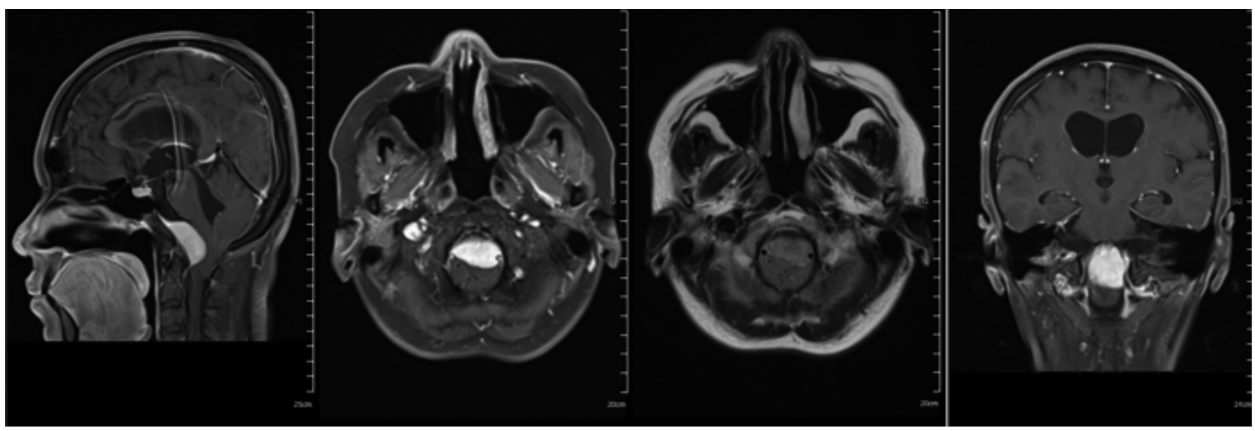

Figure 3 Magnetic resonance imaging (MRI) scan revealing a mass with a board dura base. This was a homogenously enhancing mass, measuring about 2.2 x 3.3 x 3.3 cm in the prepontine cistern, pre-medulla oblongata, posterior aspect of the clivus,and craniocervical junction, encasing the left vertebral artery, with a mass effect to cause canal stenosis. Foramen magnum meningioma is the is the most likely diagnosis.

After the patient stabilized, we ordered a magnetic resonance imaging (MRI) scan of the brain and cervical spine based on the patient's neurologic findings and suggestions of myelopathy. There revealed a board dura base homogenously enhancing mass, measuring about 2.2 x 3.3 x 3.3 cm in the prepontine cistern, pre-medulla oblongata, posterior aspect of the clivus, and craniocervical junction, with a mass effect enough to cause canal stenosis (Figure 3). Neurosurgical resection was performed after the pneumonia had resolved, and rapid antigen testing of a nasopharyngeal swab was negative for COVID-19 in the third week after admission. The neurosurgeon utilized the far lateral retrocondylar approach on the patient's left side. The neurosurgeon positioned the patient in a three-quarter position and made a hockey stick-shaped incision on the skin, starting from the mastoid process and extending upwards along the superior nuchal line. From there, the incision followed a curved path towards the inion, then downwards to the cervical spinal process. After dissection of the suboccipital muscles, elevation of the atlas (C1) hemilamina periosteum toward the sulcus vertebralis was performed, being careful not to damage either the periosteum or the vertebral artery (VA) 's venous plexus. This maneuver entails elevating and mobilizing the horizontal VA segment, which facilitates hemilaminectomy and lateral drilling. The surgeon elevated a posterolateral retrocondylar suboccipital craniotomy, encompassing the rim of the FM. The retrocondylar approach, which does not involve condylar drilling, provides a beneficial visualization while also helping to preserve joint stability. The surgeon microsurgically opened the dura just behind the VA's dural entry. The spinal portion of the accessory nerve was identified and preserved and was located posterior to the tumor. In cases of anterolateral tumors, partial removal of meningiomas revealed the intradural segment of the VA and its branches. To achieve internal debulking, patients with firm consistency tumors underwent piecemeal resection with microscissors and cupped forceps. The far lateral retrocondylar approach provides a secure surgical plane for complete removal of these tumors (Figure 4). The surgical specimen's pathological evaluation confirmed Grade I meningothelial meningioma, according to the World Health Organization (WHO). She was extubated from the mechanical ventilator on the second day after surgery. Seven days after the surgery, her neurological exam returned to normal, showing only mild residual numbness over both toes, a still reduced left gag reflex, and a new slight leftward deviation on her tongue protrusion. The patient experienced symptomatic recovery, beginning with immediate resolution of paresthesia, and was able to walk with reasonably normal gait in the second week after surgery. The patient's hoarseness and dysphagia improved, and she was able to remove the NG tube in the 6th week after the surgery. By the 8th week, the tongue deviation had disappeared and the gag reflex was fully recovered. By three months she was able to walk independently and without gait abnormality. We ordered a further MRI scan of the brain and cervical spine for follow-up postoperatively. The prepontine cistern, premedulla oblongata, and posterior of the clivus revealed post-tumor removal without any abnormal enhancing lesions (Figure 5). After six months of surgery, OSA symptoms disappeared without the need to use CPAP.

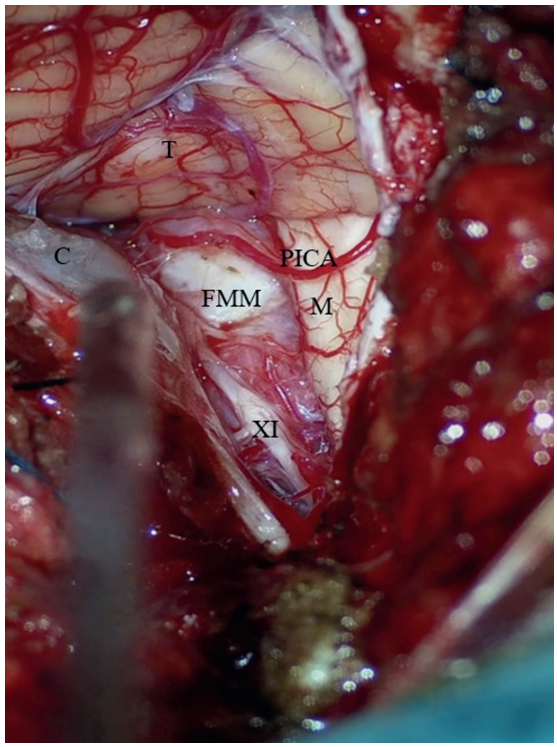

Figure 4A The left-sided far lateral retrocondylar approach: The horizontal VA segment was mobilized by elevating and not damaging the C1 hemilanima periosteum for hemilaminectomy and lateral drilling. The dura was microsurgically opened, and the spinal portion of the accessory nerve was preserved, located posterior to the tumor.

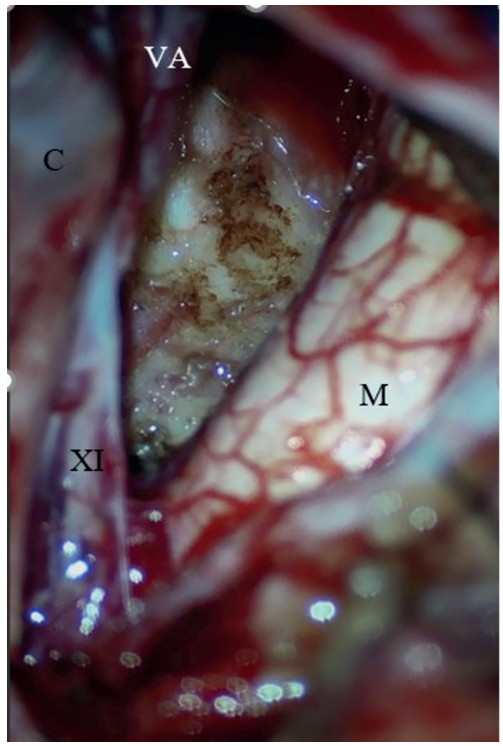

Figure 4B The left-sided far lateral retrocondylar approach: Partial removal of meningiomas revealed the intradural VA segment and its branches, providing a safe surgical plane for the total excision of foramen magnum meningioma.

FMM: Foramen magnum meningioma,
M: medullar oblongata, C: Occipital condyle,
T: Tonsillar of cerebellum, PICA: Posteroinferior cerebellar artery, XI: Cranial nerve XI

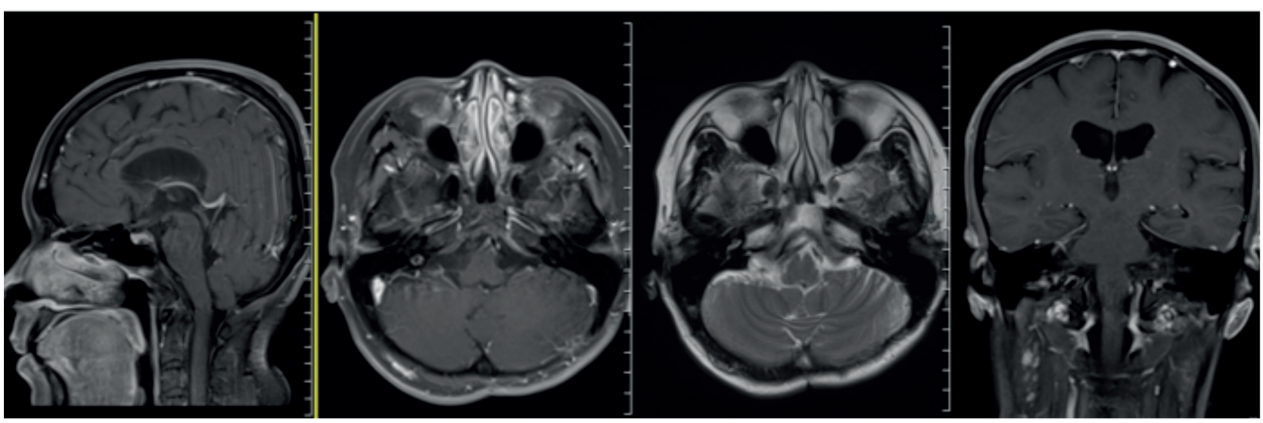

Figure 5 Magnetic resonance imaging (MRI) scan revealing post-tumor removal without abnormal enhancing lesions at the prepontine cistern, premedulla oblongata, and posterior of the clivus.

Discussion

Meningiomas, the most common brain tumor, account for 25-40% of intracranial primary tumors, primarily affecting females. Their incidence increases with age, and they are more prevalent in African-Americans.[1-3,10,11] Rarely occurring, FMMs are a common histological tumor in a challenging anatomical region due to their proximity to critical structural locations. FMMs originate from the arachnoid cells at the craniocervical junction's dura mater, a region from the lower third of the clivus to the upper margin of the axis (C2) body.[2,12] Performing surgery in this location is difficult because there are numerous delicate neurovascular structures that are susceptible to injury. The neural structures include the cerebellar tonsils, the inferior vermis, the fourth ventricle, the lower CN (IX-XII), the rostral section of the spinal cord, and the upper cervical nerves (C1 and C2). The anterior and posterior spinal arteries, posterior inferior cerebellar arteries (PICAs), and VA are among the crucial vessels.[2,13] The surgical procedure in this case is highly complex due to the presence of a ventrolateral type FMM, which is hidden in a narrow space in front of the medulla. This FMM exerts pressure on the CN VII-X, causing them to move upward while also pushing the CN XI backwards. Furthermore, it compresses the CN XII and partially encased the VA where it entered the dura. FMMs, whose clinical presentation varies depending on the size and localization of the tumor, can mimic many other neurological disorders. The clinical course is indolence with nonspecific symptoms, slowly progressing until the tumor is large enough to cause a mass effect. Long tract involvement, asymmetric motor weakness, gait ataxia, and a relatively uncommon lower CN palsy frequently manifested.[3,14,15] In this report, a 49-year-old obese female presented with rare clinical symptoms of FMM.[2] She suffered from sleep apnea with recurrent aspiration pneumonia and had progressed to quadriplegia, ataxia, and bedridden status. There are many reports of an association between the medulla oblongata lesion and sleep apnea. Smith et al. identified a specific area in the ventral medulla called the pre-Bötzinger complex, which is a component of the central pattern generator (CPG) responsible for regulating breathing. The neuron networks in this region autonomously generate rhythmic motor patterns such as walking, breathing, swallowing, and coughing without relying on signals from the motor cortex. The CPG is responsible for generating the regular rhythm and pattern of breathing by utilizing the inherent features of neuronal membranes and their interconnections. Tonic excitation is essential for expression, sourced from wakefulness dependent neural systems and peripheral and central chemoreceptors. The retrotrapezoid nucleus, located near the ventral surface of the medulla, contains central chemoreceptors that are intrinsically sensitive to changes in CO2/H+ levels. These neurons have dendrites that extend to the ventral medullary surface; they sense the pH of the surrounding cerebrospinal fluid (CSF), and axons that project to the pre-Bötzinger complex.Tonic excitation removal can disrupt respiratory rhythm, resulting in central sleep apnea. Compression of the nucleus ambiguus, which regulates pharyngeal tone, can exert pressure on CN IX and X, resulting in occlusive apnea.[16-23] The FMMs compress the ventrolateral part of the medulla oblongata, which may compress the pre-Bötzinger complex, retrotrapezoid nucleus, nucleus ambiguus, and present with obstructive sleep apnea (Figure 6).

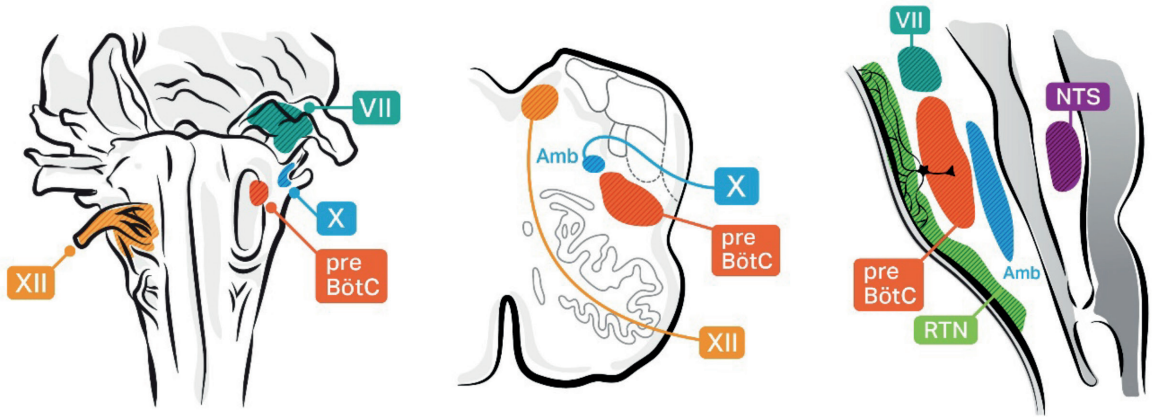

Figure 6 The central pattern generator (CPG) is located ventrolaterally in the medulla oblongata. Pre-Bötzinger complex (pre-BötC) is located in the ventrolateral medulla, caudal to the facial nucleus (VII) and ventral to the compact part of the nucleus ambiguus (Amb), a component of ventral breathing CPG, generating the regular rhythm and pattern of breathing. The retrotrapezoid nucleus (RTN), which is near the ventral surface of the medulla, is a central chemoreceptor that responds to changes in the amount of CO2/H+ in the CSF and connects to the pre-BötC. Nucleus tractus solitarius (NTS) is a component of dorsal breathing CPG. It is also the projection site for afferents critical to breathing reflex control: the carotid and aortic chemoreceptors and baroreceptors, as well as lung vagal afferents. The nucleus ambiguus send signals to the larynx and pharynx muscles through the vagus, glossopharyngeal, and accessor nerves. Hypoglossal (XII) that innervate muscles important to the maintenance of upper airway patency.

OSA is an inflammatory disorder characterized by elevated tumor necrotic factor alpha (TNF-α) levels, and intermittent hypoxia induces macrophage polarization and increased interleukin 6 (IL-6) production, confirming the presence of classic inflammatory cytokines. This increases an individual's risk of developing cardiovascular disease, endocrinologic abnormalities, and even early mortality.[24,25] We performed total tumor excision and medulla oblongata decompression in this case. Clinical OSA is reversible and can be weaned off CPAP within 6 months postoperatively. This case is analogous to previously reported cases of reversible obstructive sleep apnea after surgery to decompress the lower brain stem.[19,26]

Inhaling oropharyngeal secretions or gastric contents into the larynx and lower respiratory tract, colonized by pathogenic bacteria, causes aspiration pneumonia, an infection of the pulmonary parenchyma. Airway protective behaviors, such as swallowing and coughing, are frequently impaired in neurologic disease and contribute to an increased risk of aspiration.[27] A CPG located in the nucleus tractus solitarius (NTS) and the nucleus ambiguus in the medulla oblongata produces swallowing movements. The CPG integrates sensory signals from the mouth and sends them further down to the cranial motoneurons (CN V, IX, X, and XII), which then close the larynx and perform peristalsis in the pharynx and esophagus.[28,29] Cough is a

defensive reflex that prevents aspiration by producing a rapidly rising expiratory airflow to eject adherent material away from the vocal folds. The brainstem's NTS also houses the cough pattern generator. This case suffers from recurrent aspiration pneumonia, which indicates an underlying pathology in the functioning of speaking, swallowing, breathing, or maintaining airway protection.[30] The uncommon presentation of FMM demonstrates that a compressed and displaced medulla oblongata can disrupt airway protection, leading to a missed diagnosis, which is the definitive cause of recurrent aspiration pneumonia. This case also follows the same course as a previous study that showed that pathology in the medulla oblongata can cause problems in airway protection, dysphagia and aspiration pneumonia.[31-35]

The COVID-19 pandemic spread across the world; this case was admitted for COVID-19 pneumonia and recurrent aspiration pneumonia. Definite discrimination in diagnosing pneumonia caused by aspiration of different materials or SARS-CoV-2 might be impossible.[36,37] While there isn't universal agreement on the gold standard for diagnosing aspiration pneumonia, a broad consensus suggests considering pneumonia in the context of suspected aspiration or dysphagia. Clinical criteria include acute respiratory symptoms, fever, and newly infiltrated areas in a typical location. In supine positions, the posterior segments of the right upper lobe and the right apical segment of the lower lobe are most likely affected. The patient is at risk for oral colonization of bacteria on the NG tube due to dysphagia, poor oral hygiene, malnutrition, and antibiotic use. She also faces the risk of aspiration due to OSA.[30] Early administration of antibiotics in presumed cases of aspiration pneumonia is required to prevent morbidity and mortality[38], and the correct triage of these patients is essential to decrease the risk of the spread of infection and to protect medical personnel from inadvertent exposure to the infection. Radiologic features such as bilateral subpleural patches of ground glass opacity (GGO), especially in basal distribution, as typical for the diagnosis of COVID-19 pneumonia in suspected cases, are also fairly common in aspiration pneumonia.[36] For diagnosis COVID-19, the rapid SARS-CoV-2 antigen showed comparable sensitivity and specificity with the real-time reverse transcription polymerase chain reaction (RT-PCR) assay.[39] This case is analogous to previously reported COVID-19 and aspiration pneumonia, which challenges the differential diagnosis of pneumonia.[36,40] In this case, it may be possible that both conditions were co-existing.

There have been previous reports of FMM with COVID-19 in pregnant women who lost their lives as a result of the additional complications, one patient had to undergo urgent surgery due to rapid clinical deterioration.[41] In this case report, the far lateral retrocondylar approach to FMM resection with COVID-19 yielded a favorable outcome. After her pneumonia resolved she underwent surgery. In this case, she had already had a Pfizer-BioNTech mRNA vaccine. Similar previous studies indicate that vaccines appear to be safe and effective tools in preventing severe COVID-19, hospitalization, and death against all variants of concern.[42]

Conclusion

Successfully completely removing FMM resolved the obstructive sleep apnea and aspiration pneumonia in a COVID-19 patient. Rarely, FMM-compressed medullar oblongata can present with sleep apnea and aspiration. The OSA and recurrent aspiration pneumonia may indicate an underlying pathology in the medulla oblongata.

Conflict of interest

The author has declared no conflict of interest.

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Association between Depression and Obesity in Elderly

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Abstract:

Background: Obesity has been related to psychological disorders such as depression and has been shown to be a key contributor to morbidity and to adversely affect working ability and quality of life.

Objective: The purpose of this study was to explore the association between body mass index (BMI) and depression amongst elderly people.

Materials and Method: This was a cross-sectional analytic study. Participants were living in Suphan Buri Province, Thailand. Data, including demographic information, body composition record, The Thai geriatric depression scale: TGDS-15 assessment was used to measure levels of depression from 34 elderly people. Obesity and normal weight were defined as body mass index ≥ 25 and 18.5-22.9 kg/m^2, respectively.

Results: The association between depression and obesity were explored, controlling for age and BMI. After adjustments, a higher level of depression was found in obese elderly (compared with normal weight elderly) but not statistically significant between group. However, no significant association between depression and BMI. The positive associations between depression with BMI, weight, and the percentage of body fat, after controlling for potential confounders.

Conclusion: The present study found a positive association between depression in this obese elderly group. Future research should continue to explore the complex nature of obesity and develop more appropriate assessments and interventions to confirm these findings.

Keywords: Obesity, Elderly, Depression

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Introduction

Along with the aging process, some natural physical changes in the body composition can cause an increase of fat and its redistribution can lead to obesity. For example, increased fat accumulation, caused by decreased energy expenditure, decreased muscle mass and bone mass contribute to a lower metabolic rate. Hormonal changes, including decreased secretion of growth hormone and testosterone, will both decrease muscle mass and increase fat mass, and decrease the physiological response to leptin and thyroid hormones.

The elderly may have an increased risk of obesity due to functional limitations, energy intake, or low physical activity that may promote weight gain. The increasing prevalence of obesity in the population in general is of increased public health concern[1] and has a profound impact on people throughout their lives. Obesity is a significant health risk factor among the elderly. Age may be related to weight and mood changes. In general, evidence indicates that increased weight is related to a range of psychological disorders, including anxiety and depression. The obese elderly are prone to various chronic diseases that also increase their risk of psychological disorders, such as depression. Psychological conditions are a common feature of obesity. Psychological conditions, such as anxiety and depression, are associated with changes in body weight.

Obesity is a condition with abnormal or excessive fat accumulation that may be associated with impaired health status. Obesity is defined on the basis of body mass index (BMI), a standard measure of body composition. It is the ratio of weight in kilograms divided by the height in meters squared, BMI is a well-established measure of obesity overall mortality predictor. A link between psychological conditions and obesity has been proposed, as negative emotional aspects of anxiety and depression can induce behavioral and physiological changes that can contribute to obesity processes.[2,] Adipose tissue is an abundant source of inflammatory molecules. The presence of these markers significantly predicts depression and may cross the blood brain barrier and influence neurotransmitter levels related to depression.[4] Obesity interventions must take into account negative health outcomes associated with psychosocial conditions.[5] Previous research has indicated that obesity is associated with various chronic diseases such as cardiovascular diseases, cancers, diabetes mellitus, and there is strong evidence for an association between BMI and psychological disorders, especially anxiety and depression.[6,7] In 2019, one in every eight people, or 970 million people around the world were estimated to be living with a psychological disorder, anxiety and depression disorders being the most common.[8] Psychological disorders such as anxiety and depression are among the most prevalent disorders in the elderly people.[9,10] A psychological disorder is defined as a syndrome that presents clinically significant abnormalities in cognition, emotional control, or the behavior of a person. This reflects abnormalities in the psychological, biological, or developmental processes underlying psychological functioning.[11] The prevalence of anxiety and depression among elderly were found to be 32.7% and 37.3%, respectively.[12]

Depression increases with increasing age. The aged 70-79 years had the highest prevalence (2.6%).[13] The risk of obese individuals has been reported to be at a 55% higher risk of depression.[14] The prevalence of obesity is increasing rapidly in worldwide. Depression is a very prevalent psychological health disorder which was found to be associated with obesity.[15] Prevalence of depression and obesity was 1.3% in male and 2.0% in female.[16] Depression is a very

prevalent psychological health disorder which was found to be associated with obesity.[13] Depressive disorders in the elderly are related to therapeutics, systemic illness, physical, social and psychological changes associated with ageing, depressed mood, sleep disturbances or sleep disorders, low energy, and poor concentration. Depressed states and obesity have been found to be associated with an increased risk of functional disability.[14] Depression is the most common psychological disorders among obese patients. Causes of depression are complex and may involve genetic characteristics, society and environment, and neurobiology.[19] In addition, inflammation significantly predicted depression[4] and may access the brain and influence neurotransmitter related to depression. It has been suggested that the association between depression and obesity is probably due to the action of certain genes involved in both pathologies. Obesity and depression are disorders with a high prevalence and an extraordinary effect over global morbidity and mortality.[20]

Depression is different from usual mood fluctuations, during a depressive symptom, the person experiences depressed mood e.g., feeling sad, empty, hopeless or a loss of pleasure or interest in activities, for most of the day. Several other symptoms in older adults are also present, which may include memory difficulties or personality changes poor concentration, feelings of excessive guilt or low self-worth, thoughts about dying or suicide, sleep disturbances, including insomnia or sleeping too much, changes in appetite or weight by increased cravings for food and weight gain, and feeling especially tired or low in energy. Both of depression and obesity conditions have been found to be associated with increased risk of functional disability.[5] Previous research has indicated that stronger evidence for an association between BMI and psychological disorders, especially in depression.[7] In obese individuals, decreased insulin sensitivity correlates significantly with greater depressive symptomology.[21] Plasma levels of the adipose-derived hormone leptin negatively correlates with symptoms of depression in women and men.[22] In addition to depression in the elderly is a common problem especially those with physical illnesses such as chronic diseases, which often affect the quality of life of the elderly.[23]

Therefore, psychological conditions can influence human eating behavior, increase appetite, anxiety, and depression.[16] The objective of this study was to analyze how depression are associated with BMI in the elderly comparing two weight categories, normal weight (BMI between 18.5-22.9 kg/m^2) and obesity (BMI ≥ 25 kg/m^2). The hypothesis is that as anxiety and depression scores increase, BMI will tend to increase as well.

Materials and Method

This is a cross-sectional analytic study, carried out in Muang District, Suphan Buri Province. Its aim was to analyze the association of psychological conditions, including depression in obese elderly.

Participants

Samples: the study was conducted among an elderly population, aged ≥ 60 years. Purposive sampling was used as the sampling method. In this study they were divided into 2 categorized groups, the elderly with obesity (BMI ≥ 25 kg/m^2) and the elderly with normal weight (BMI between 18.5-22.9 kg/m^2) and included 34 elderly people, both male and female.

Inclusion criteria were community dwelling elderly, both male and female, aged ≥ 60 years with obese (BMI ≥ 25 kg/m^2) or normal weight (BMI between 18.5-22.9 kg/m^2) who had a good level of consciousness and the cognitive ability to respond to

questions, could communicate normally, cooperate, and able to sign an informed consent form.

Exclusion criteria were providing an incomplete response to the questionnaire, having neuropsychiatric or nervous symptoms and current use of psychotropic medications.

Data collection tool in this study consisted of 3 parts

The first part: This part involved collecting the demographic characteristics information including name, age, gender, status, education level, occupation, illness history, a history of drug allergies, and a history of drinking and smoking and was collected by using a researcher-made questionnaire. Thirty-four participants who returned the completed questionnaires were selected.

The second part: Participants had body analysis measured for the calculation of body mass index (BMI) with the formula weight divided by height squared (kg/m^2). Body mass index (BMI) was categorized into normal (18.5-22.9 kg/m^2), overweight (23.0–24.9 kg/m^2) and obese (≥ 25.0 kg/m^2). Participants were grouped according to their BMI. The body composition of participants, blood pressure, heart rate, height, weight, body fat percentage, body water percentage, muscle mass, bone mass, and calories intake were recorded.

The third part: This aimed to gather information concerning the psychological conditions including anxiety and depression, after linking the completed demographic data and body analysis record from the first and second parts. The psychological conditions were assessed by using a questionnaire, 34 participants had returned a complete assessment of their psychological history, including depression.

Thai geriatric depression scale: TGDS-15 was utilized to evaluate the levels of depression, introduced by Yesavage in 1983[19] and was translated into Thai by Wongpakaran N. in 2010.[2] Geriatric Depression Scale(GDS) has been tested and used extensively with the older population. This tool involves 15 items and 2 subscales, yes or no, emotional support assessing positively, sympathy, and encouragement for the expression of emotions (5 items), and emotional negative affection (10 items). GDS is a short, simple, and easy to complete for patients who have short attention spans or feel easily fatigued. It takes about 5 to 7 minutes to complete. The GDS has a 92% sensitivity and 89% specificity when evaluated against diagnostic criteria. The validity and reliability of the tool have been supported through both clinical practice and research.[21]

Statistical analysis

The collected data were analyzed with SPSS statistics. After test the normality of data, the demographic information of participants was reported in descriptive statistics; quantity, frequency (percentage), mean ± standard deviation (SD) was applied for categorical variables. Independent t-test was used to compare depression between group; obese elderly group and normal weight elderly group. And Pearson correlation coefficient was used to assess the correlation between obese elderly and depression. 95% confidence interval were provided in this analysis, $p < 0.05$ was regarded as statistically significant.

In the first analysis, regarding to compare depression score between obese elderly group and normal weight elderly group by independent T-test. The score of depression divided into 3 levels; the score range of 0-5 points = no depression (normal), the score range of 6-10 points = moderate depression, and the score range of 11-15 points = severely depression.

In the second analysis, the Pearson correlation coefficient was used to determine the association between depression and biological data such as BMI, weight, and percent body fat in obese elderly.

Results

Table 1 represents the demographic data and body composition analysis in obese elderly and normal weight elderly, the mean age in obese elderly was 66.82 ± 4.50 years and 64.71% were females and mostly were graduated bachelor's degree (41.18%). For normal weight elderly, the mean age was 67.59 ± 7.36 years and over half of them were female (70.59%). The average BMI in obese elderly and normal weight elderly were 27.95 ± 1.95 and 22.49 ± 0.38, respectively. The obese elderly group had higher levels of blood pressure (153.18 ± 20.28, 139.88 ± 11.73) pulse rate (74.71 ± 7.03, 70.59 ± 7.85), percent body fat (30.18 ± 3.11, 21.99 ± 1.42), percent bone mass (2.92 ± 0.29, 2.65 ± 0.35) and calories profiles (1518.65 ± 216.06, 1207.06 ± 141.27) than normal weight elderly group, respectively. And the normal weight elderly group had higher percent of body water (50.16 ± 2.12, 45.74 ± 2.49) and muscle mass (33.75 ± 2.16, 31.13 ± 2.11) than obese elderly group, respectively.

Table 1 Demographic data of participants (n = 34)

Demographic	Group			
	Obese elderly		Normal weight elderly	
	n	Percentage	n	Percentage
Gender				
Male	6	35.29	5	29.41
Female	11	64.71	12	70.59
Education level				
Primary school or lower	5	29.41	2	11.76
Secondary school	2	11.76	1	5.88
High school	1	5.88	1	5.88
Bachelor's degree	7	41.18	10	58.82
Higher than bachelor's	2	11.76	3	17.65
Age (year) (Mean ± SD)	66.82 ± 4.50		67.59 ± 7.36	
Blood pressure (Mean ± SD)				
Systolic	153.18 ± 20.28		139.88 ± 11.73	
Diastolic	84.59 ± 14.81		78.82 ± 10.74	
Pulse rate (Mean ± SD)	74.71 ± 7.03		70.59 ± 7.85	
Height (cm.) (Mean ± SD)	160.53 ± 6.62		157.94 ± 7.70	
Weight (kg.) (Mean ± SD)	72.29 ± 9.49		56.23 ± 5.67	
BMI (Mean ± SD)	27.95 ± 1.95		22.49 ± 0.38	
Body fat (%) (Mean ± SD)	30.18 ± 3.11		21.99 ± 1.42	
Body water (%) (Mean ± SD)	45.74 ± 2.49		50.16 ± 2.12	
Muscle mass (%) (Mean ± SD)	31.13 ± 2.11		33.75 ± 2.16	
Bone mass (%) (Mean ± SD)	2.92 ± 0.29		2.65 ± 0.35	
Calories (kcal) (Mean ± SD)	1518.65 ± 216.06		1207.06 ± 141.27	

Participant characteristic in terms of depression is summarized in table 2. Level of depression measured by Thai geriatric depression scale: TGDS-15. The most common depression levels of both obese elderly and normal weight elderly were no depression (n = 10, 12 respectively) but there was more moderate depression in obese elderly (n = 7) than normal weight elderly (n = 5). However, the total depression scores of both groups were not significantly different (p = 0.579).

Table 2 Depression levels of participants (n = 34)

TGDS Scale	Group				Mean Difference	t	p-value
	Obese elderly (n = 17)		Normal weight elderly (n = 17)				
	n	Mean ± SD	n	Mean ± SD			
No depression	10	2.10 ± 1.60	12	2.00 ± 1.48	0.100		
Moderate depression	7	6.86 ± 0.90	5	7.20 ± 0.84	-0.343		
Severely depression	0	-	0	-	-		
Total	**17**	**4.06 ± 2.75**	**17**	**3.53 ± 2.76**	**0.529**	**0.560**	**0.579**

Table 3 shows no significant association was observed between depression and age, BMI, weight, percent of body fat. However, the BMI, weight, and percent body fat has association in positive direction with de pression score (r = 0.142, 0.216, 0.066 respectively).

Table 3 Correlations of TGDS score (depression) with demographic data of participants

Variables	r	*p*
Age (years)	-0.159	0.368
BMI	0.142	0.424
Weight (Kg)	0.216	0.221
Body fat (%)	0.066	0.710

*Correlation is significant at the 0.05 level (2-tailed).

Discussion

During the period of old age, various stressful problems such as disease, obesity, chronic disease, and a lack of activity in daily life can affect the psychological conditions of the elderly. The study shows that higher BMI correlates with a higher percentage of psychological conditions, anxiety and depression. Researchers believe that BMI has an additive influence on increasing the likelihood of deteriorating psychological state, which is considered to be of greater importance for the elderly. This study aimed to analyze how anxiety and depression are associated with BMI in the elderly across two

weight categories, including normal weight (BMI between 18.5-22.9 kg/m^2) and obesity (BMI ≥ 25 kg/m^2). It also examined a range of sociodemographic, physical health, and body composition factors. Firstly, as hypothesized, results indicated that as anxiety and depression increase, so will the BMI increase. Based on the results of this study, about 34 participants over 60 years old were classified as obese or normal weight. There was a positive correlation between body fat percentage, BMI, and anxiety. Our data indicated that depression was associated in positive direction with BMI, weight, and the percent of body fat, which means that a higher BMI, weight, and percent of body fat were associated with a higher risk of depression. This study infers that the BMI associated positively with anxiety and depression in obese elderly. These data are in agreement with the research by Trine Tetlie Eik-Nes, et al.[5] However, there was no significant difference in anxiety and depression levels among the obese elderly compared with the normal weight elderly group. Over time, participants with the high anxiety and depression scores were more likely to be obese elderly than normal weight elderly. Thus, the results of this study, conducted among obese elderly (BMI ≥ 25 kg/m^2) and normal weight elderly (BMI between 18.5-22.9 kg/m^2) with psychological conditions, including anxiety and depression, are consistent with previous studies and emphasizes the association between BMI and anxiety and depression.

We discovered a significant positive association between anxiety and depression in the obese elderly group. Previous studies have suggested a link between obesity and depression. Obese individuals are at an increased risk of developing depression. Also, individuals with depression are at an increased risk of future obesity. Depression is an important outcome measure in the elderly that has been found to be related to BMI.[22] Growing evidence therefore suggests that obesity may increase the risk of depression.[6] Several studies have shown a moderate and positive relationship between anxiety severity and BMI.[5,23] The relationship between body fat and anxiety in obesity has great relevance for clinical practice. Recently, a few studies have showed that anxiety may be a significant predictor of obesity.[24]

The obese elderly group were more likely to exhibit increased anxiety than the normal weight group. The results of statistical analyses also showed that the risk of anxiety was increased with the development of obesity. We found a positive association between anxiety and BMI and percentage body fat. The associations of anxiety and obese elderly was in line with several previous studies[25] and evidence has also shown that a positive association in promoting the development of anxiety.[26] Our results and several previous studies[27] show that elderly individuals with obesity have an increased risk of anxiety and depression. Prevalence of anxiety and depression in developing countries has grown in parallel with increasing prevalence of obesity[25] and many studies have shown a higher prevalence of obesity in people with depression when compared with normal weight[28], a healthier BMI is associated with fewer symptoms of depression. One important factor for obesity and depression is stress, chronic stress in persons with depression leads to elevated levels of cortisol[17] and cortisol has been specifically correlated to an increase of abdominal fat mass. High levels of stress or negative mood can affect eating habits and may lead to higher consumption of foods high in fat, carbohydrates and sugars. Comfort eating refers to a tendency to eat in response to negative emotions; depression, anxiety, and stress.[29] It has been found that eating in response to negative emotions mediates the positive associations between depression,

with increases in BMI and associated circadian changes having an effect on behavior related to food. Insufficient level of the neurotransmitter serotonin causes depression because the consumption of sugar decreases serotonin. Depressed individuals tend to feel sugar cravings. Another factor for obesity and depression is inflammation. The relationship between obesity, anxiety, and depression is associated with reduced immune function.[30,31] This is because weight gain has been shown to activate inflammatory pathways and inflammation has been associated with depression. The inflammatory response may trigger inflammation and brain processes that are ultimately associated with depression. The altered diet and activity alter gut microbiota, this has been shown to have an effect on mood.[7] Inflammatory activity in adipose tissue is the cause of insulin resistance, which in turn is associated with obesity. In terms of the association between overweight and functional disability, depression and obesity may increase the risk of independent functional disability.[32] Genetic influences might also play a role in the association between gene, BMI, and depression. Lifestyle and behavior, such as smoking and lack of physical activity, are also more prevalent among obese and psychological disorders.

Therefore, these changes are risk factors for anxiety and depression. Recommendations for obese elderly people are to change their dietary habits, a healthy eating pattern is associated with fewer depressive symptoms and a lower risk of developing depression.[33] Physical activity and exercise are effective in reducing body weight and these can be affected by reduced motivation or self-efficacy associated with anxiety or depression, the efficacy of exercise in reducing symptoms of depression are well known. Many studies indicate that weight loss due to caloric restriction improves anxiety and depressive symptoms among obese patients with anxiety and depression.[34] Often after the age of 60, physical health activity and energy expenditure are reduced, making people to be more prone to fat accumulation and fat redistribution. Low physical activity is one of the factors that may mediate the relationship between obesity and depression. Depression can lead to less physical activity and is a leading cause of obesity. Anxiety and depression may interfere and may play a role in obesity. Therefore, it is important to maintain a normal weight or prevent weight gain.[35]

Our study had some limitations. First of all, only a small number of obese elderly and normal weight elderly were evaluated. In further studies, it is necessary to confirm whether our findings will apply to different populations. Secondly, there is no gender separation for comparisons between men and women. We were unable to determine the effect of gender on the relationship between obesity and anxiety and depression.

Conclusion

We have demonstrated a cross-sectional analytic association between anxiety, depression, and BMI. This study reflects a higher risk of psychological conditions, namely anxiety and depression in obese elderly. Moreover, obese elderly present higher levels of anxiety and depression. Our study reports significant interactions between anxiety and depression. The results support the connection between psychological health and the presence of obesity. Future research with larger study samples be needed to further evaluate the association between psychological conditions and obesity in the elderly.

Author Contributions

Conceptualization, W.R., and P.S.; methodology, W.R., and P.S.; software, P.S.; validation, P.S.; formal analysis, W.R., and P.S.; investigation, P.S., and J.R.; data

curation, W.R., N.P., N.S., and P.S.; writing—original draft preparation, W.R., and P.S.; writing—review and editing, P.S.; visualization, P.S.; supervision, P.S.; project administration, P.S.; funding acquisition, W.R. and P.S. All authors have read and agreed to the published version of the manuscript.

Data Availability Statement

The data presented in this study are available within the article.

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