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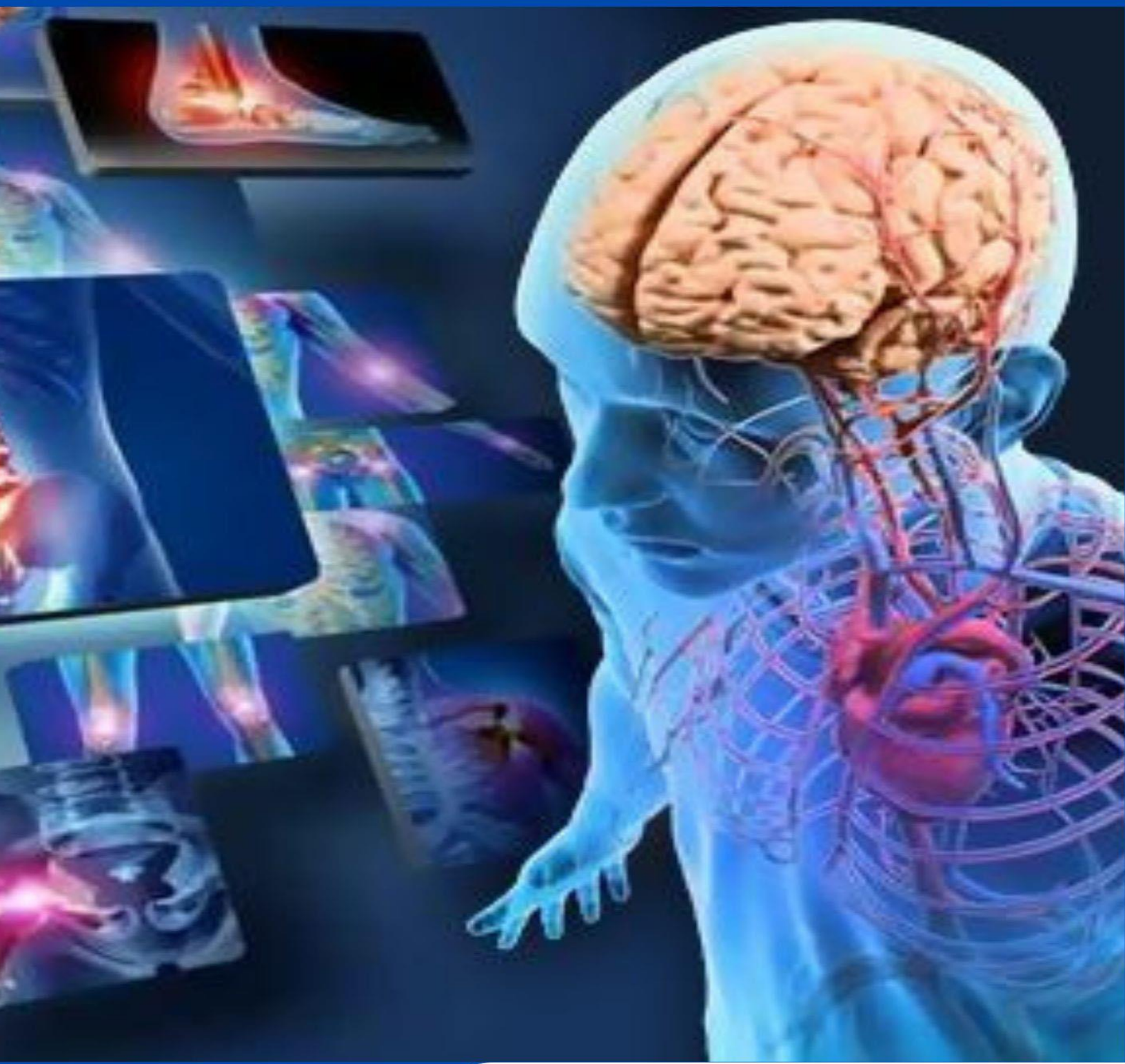

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ARTICLES:

PLAYING "GAME OF DIGITS" - BUILDING A TOY UNIVERSE BASED ON THE NATURAL UNIVERSE BY USING MATHEMATICS AND THEORETICAL COMPUTER SCIENCE

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ABSTRACT:
Each section of this article was previously shared in preprints during recent years (e.g. 25, 26) though the five sections have never been joined before.
The greatest obstacles to understanding the cosmos, and beginning the journey to the union of quantum mechanics with General Relativity (quantum gravity), will be a) the human reluctance to accept a paradigm shift to determinism, and b) the human timidness resulting in the inability to be able to seriously consider the universe being generated by innumerable centuries of progress in computer / holographic science, and actually being constructed of mathematics.
This article begins with "vector-tensor-scalar geometry" interacting photons and gravitons to produce the quantum spins of matter particles, the Higgs boson, plus the particles of the weak and strong nuclear forces. It then proposes the universe uses base-2 mathematics (a.k.a. electronics' binary digits), the topology of Mobius strips and figure-8 Klein bottles, plus the geometry mentioned before, to produce photons and still hypothetical gravitons and non-hypothetical mass. It's then proposed that the three-dimensional figure-8 Klein bottles composing the universe possess space-time's four dimensions (3 of space + 1 of time) when Wick rotation is programmed into them. This programming is adaptive, depending on the strength of gravity and electromagnetism (in Special Relativity, time slows in intense gravity and on approaching the speed of light).
Because of the rotating between the x- and y-axes in Wick rotation, there's a space-time we call imaginary or higher dimensional that is just as real as ordinary space-time. Gravity also leads to mass here - "dark" matter – and that matter's associated "dark" energy. Use of so-called "imaginary" time and quantum mechanics' entanglement removes boundaries between the "imaginary" and known realities. Boundaries between the simulated universe and this known universe are removed by the imaginary's affecting virtual reality to produce an augmented reality.
KEYWORDS:
Computer-generated universe, Mathematical universe, Simulation, Entanglement, Relativity, Augmented reality

Introduction

WORMHOLES AND WARP SPEED

The introduction's objective is to lead-in to the building of a toy universe based on the natural universe by using mathematics (geometry and topology without any algebra or equations) and

theoretical computer science. It does this by speaking of wormholes and their use in interstellar/intergalactic travel. Such travel is not confined to the future simulation. Use of virtual reality, augmented reality, so-called "imaginary" time and quantum mechanics' entanglement shows, in section 5, that boundaries between the simulation and this known universe are removed. A 2009 electrical-engineering experiment at America's Yale University, together with the ideas of Albert Einstein, tells us how we could travel to other stars and galaxies. Electrical engineer Hong Tang and his team at Yale demonstrated that, on silicon-chip and transistor scales, light can attract and repel itself like electric charges or magnets (1). This is the Optical Effect.

For 30 years until his death in 1955, Einstein worked on his Unified Field Theory with the aim of uniting EM or ElectroMagnetism (light is one form of this) and G or Gravitation. Achievement of this means the quantum components (gravitons) of gravity/spacetime-warps^ between spaceships and stars could mimic the Optical Effect and be attracted together, thereby largely eliminating distance (this is similar to traversing a wormhole, or shortcut, between folds in space-time). The beginning of achievement of this union would seem to be Einstein's paper "Do gravitational fields play an essential role in the structure of elementary particles?" (2) Though this paper was originally intended to explain atomic structure, it can explain G-EM unity if used as inspiration for a "vector-tensor-scalar geometry".

^ General Relativity says gravity is a push caused by the curvature of space-time and gravitation therefore is space-time.

Section 1 -
VECTOR-TENSOR-SCALAR GEOMETRY

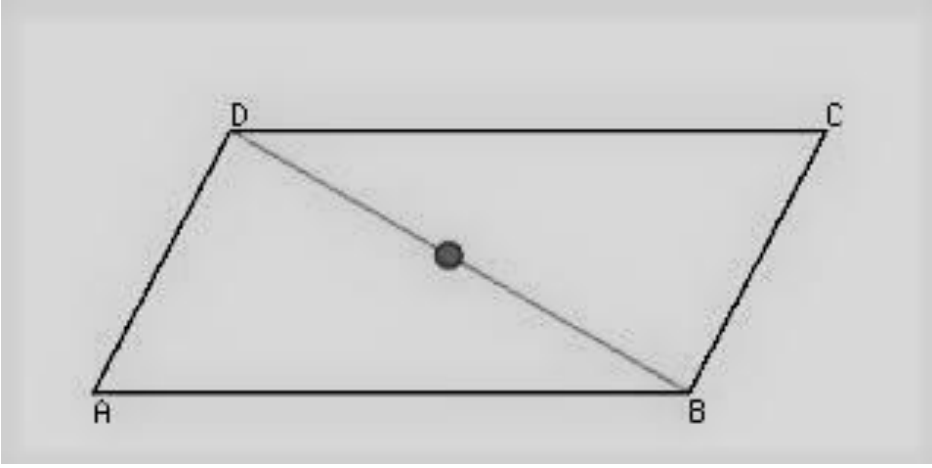

Figure 1 - PARALLELOGRAM WITH DIAGONAL AND CENTRAL SCALAR POINT (this illustrates a simple geometry which includes vectors, tensor calculus, and the scalar – it was conceived by the author to help explain gravitational-electromagnetic unification.)

A ***vector*** is a quantity which possesses both magnitude and direction. Two such quantities acting on a point (represented by the central dot of the Scalar Higgs boson) may be represented by two adjoining sides of a parallelogram (e.g. CD and AD), so that the resultant diagonal^ also represents the vectors. The two sides and diagonal thus illustrate the graviton's spin 2 and the photon's spin 1. The resultant diagonal represents the interaction of the sides/vectors (1÷2 equals the quantum spin of every matter particle: 1 / 2). **Tensor** calculus changes the coordinates of the sides and diagonal into the coordinates of a single point on the diagonal. This **scalar** point is associated with particles of spin 0. If the mass^^ produced previously happens to be 125 GeV/c2, its union with spin 0 produces the Higgs boson.

^ The resultant diagonal of those two sides can be pictured as a boat being driven in, say, the vertical direction across a river while simultaneously being pushed horizontally by the river's fast-flowing current.

^^ 125 GeV/c2 united with spin 0 means the central scalar point of the Higgs boson is related to the vector of the graviton, and the Higgs field (the boson is an excitation of this field) is therefore united with the supposedly unrelated gravitational field (together with the latter's constant interaction with the electromagnetic field).

It must be remembered that referring to space alone is incomplete. Living in space-time, it's necessary to add some sentences about the time factor. The photon must interact with the graviton to produce the mass of the weak nuclear force's W and Z bosons. To produce their quantum spin, the photon's spin 1 needs to react with the graviton's spin 2. That is, the photon's turning through one complete revolution needs to be combined with the graviton's being turned through two half-revolutions.^ Incorporating the time factor as a reversal of time in the middle of the interaction**:** a gravitonic half revolution is subtracted from the photonic full revolution then the graviton's time-reversal adds a half revolution (1-½+½ = the spin 1 of W and Z bosons). The strong nuclear force's gluon's quantum spin of 1 could arise in the same way as the spin 1 of weak-force bosons.

^ Professor Hawking writes,
"What the spin of a particle really tells us is what the particle looks like from different directions." (3)
Spin 1 is like an arrow-tip pointing, say, up. A photon has to be turned round a full revolution of 360 degrees to look the same.
Spin 2 is like an arrow with 2 tips - 1 pointing up, 1 down. A graviton has to be turned half a revolution (180 degrees) to look the same.
Spin 0 is like a ball of arrows having no spaces. A Higgs boson looks like a dot: the same from every direction.

Spin 1 / 2 is like a Mobius strip. A particle of matter has to be turned through two complete revolutions to look the same, and you must travel around a Mobius strip twice to reach the starting point.

The interacting gravity and electromagnetism produce mass e.g. they can form a Higgs boson or the weak nuclear force's bosons as well as matter. On a cosmic level - if gravitational and electromagnetic waves focus on a protoplanetary disk surrounding a newborn star, the quantum spin of the particles of matter in the disk (1 / 2) could imprint^ itself on the waves' interaction and "concentrically construct" a planet (build it up layer by layer) from vector-tensor-scalar geometry's 1÷2 interaction. If the waves focus on a region of space where there's no matter, the opposite interaction occurs and the graviton's spin 2 is divided by the photon's spin 1 to produce 2÷1. The mass produced has the spin inherent in a body of gravitational waves, and could be an alternative method to supernovas for producing black holes.

^ What do I mean by "imprint"? To explain using something different – when a laser scanner reads a barcode, the information in the barcode is "imprinted" in the scanner. When gravitational and electromagnetic waves scan a protoplanetary disk, the info in the disk is recorded or imprinted in the waves. When they scan "empty" space-time, the info pertaining to the graviton's spin of 2 (2/1) is imprinted since gravity is space-time according to General Relativity - it says gravity is just another term for the curvature of space-time.

Section 2 -
BINARY DIGITS AND TOPOLOGY

As mentioned above, the vector-tensor-scalar geometry inspired by Einstein's 1919 paper "Do gravitational fields play an essential role in the structure of elementary particles?" is only the beginning of gravitational-electromagnetic unification. Unity also requires this century's words about "bits and topology".

These five scientists support the idea of the universe being composed of information/mathematics:

a) The digital physics pioneered by Professor Edward Fredkin believes that biology reduces to chemistry reduces to physics reduces to the computation of information. (4)
b) In 1990, John Wheeler (1911-2008) suggested that information is fundamental to the physics of the universe. According to this "it from bit" doctrine, all things physical are information-theoretic in origin. (5)

c) Erik Verlinde says gravity is not a fundamental force of nature, but an emergent phenomenon. In the same way that temperature arises from the movement of microscopic particles, gravity emerges from the changes of fundamental bits of information, stored in the very structure of spacetime. (6)
d) Cosmologist Max Tegmark hypothesizes that mathematical formulas create reality. (7)
e) "Pioneered (in the late 1980's) by Rafael Sorkin, a physicist at the Perimeter Institute in Waterloo, Canada, the theory (causal sets) postulates that the building blocks of space-time are simple mathematical points that are connected by links, with each link pointing from past to future." (8)

It seems plausible that the particular values of quantum spin could be determined by another set of particular values viz those in electronics' binary digits, which always take the form of either 1 or 0. (Electronics could thus insert Artificial Intelligence and defiance of the Uncertainty Principle into everything from the subatomic scale through the biological to the astronomical.^) First, the 1's and 0's form the shape of a Mobius strip, which is merely two-dimensional (2-D).

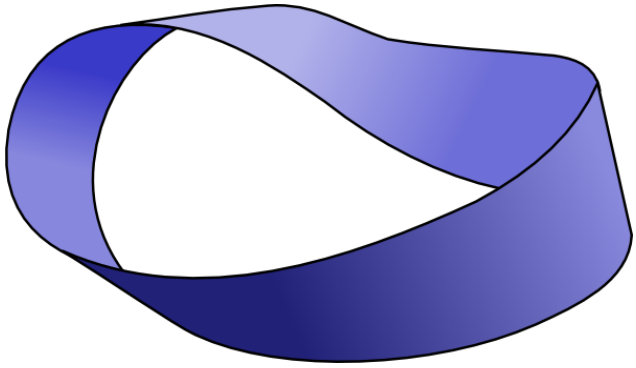

Figure 2 - MOBIUS STRIP (source: http://www.clker.com/cliparts/3/7/a/9/12205465347817139 51lummie_Mobius_Strip.svg.hi.png)
Quantum spin of matter particles (1 / 2) is like a Mobius strip. A particle of matter has to be turned through two complete revolutions to look the same, and you must travel around a Mobius strip twice to reach the starting point.

To use words from a recent science paper-
In a holographic universe, all of the information in the universe is contained in 2D packages trillions of times smaller than an atom. (9)
("Holographic" would have the accepted cosmological meaning of the entire universe being seen as two-dimensional information – from Mobius strips, according to this article - projected into the three dimensions we're familiar with.)

^ Binary digits are proposed to be the Hidden Variables which "are an interpretation of quantum mechanics based on the belief that the theory is incomplete and that there is an underlying layer of reality that contains additional information about the quantum world. This extra information is in the

form of the hidden variables, unseen but real quantities. The identification of these hidden variables would lead to exact predictions for the outcomes of measurements and not just probabilities of obtaining certain results." (10)

Then two strips must be joined to make a 4-D Klein bottle (11) which has length, width, depth and, when Wick rotation is programmed into the strips as a subroutine (see Fig. 4), the 4th dimension of movement in time. The type of Klein bottle formed would appear to be the figure-8 Klein. A diagram of many figure-8 Klein bottles would show that their positive curvature (on the spherical parts) fits together with their negative curvature (on saddle-shaped parts) to cancel and produce, on a cosmic scale, the flat curvature of space-time (12). When you have trillions of Mobius and figure-8 Klein elements assembled, you can follow the theory of the mass-giving Higgs field being the result of various couplings. (13) This theory has lost popularity since the Higgs boson was discovered. But an implication of a 1919 paper by Einstein called "Do gravitational fields play an essential role in the structure of elementary particles?" is that the coupling is between gravitons and photons. That could mean coupling is between the Mobius strip and the figure-8 Klein bottle (these exist on a level between photons/gravitons and 1's/0's, being built up into the particles and composed of the binary digits). With trillions of Mobius and figure-8 Klein elements assembled, these (now respectively called photons and gravitons) must interact via vector-tensor-scalar geometry to give matter what we call the emergent property of mass**:** similar to hydrogen and oxygen combining to give water what we call wetness. This proposed link between the Mobius strip and the Mobius doublet (figure-8 Klein bottle) would also be a link between the photon and graviton, suggesting unification of electromagnetism with gravitation. It also confirms Verlinde's idea that gravity is an emergent property (emerging from maths).

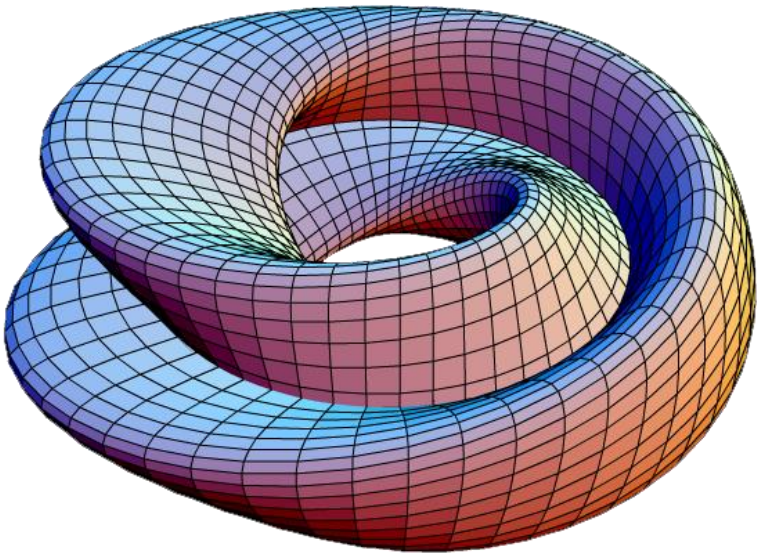

Figure 3 - MOBIUS DOUBLET (FIGURE-8 KLEIN BOTTLE)

(source: https://upload.wikimedia.org/wikipedia/commons/7/73/KleinBottle-Figure8-01.png) Note that, when considering many bottles, the reddish positive curvature fits together with the bluish negative curvature to produce the flatness implying space-time's infinity and, since space and time are always unified, its eternity. (In flat space-time, light beams travel in straight lines and can go infinite distance without ever meeting.)

Section 3 -
WICK ROTATION, SUPERSYMMETRY, AND SIMPLY-CONNECTED

Following Albert Einstein's example of turning Max Planck's quanta (which, for years, Planck and all other scientists considered purely mathematical) into explanation of the physical photoelectric effect, the Wick rotation used to describe imaginary time may be transformed from mathematical "trickery" to physical meaning, and provide a modern way to unite space and time into one space-time.

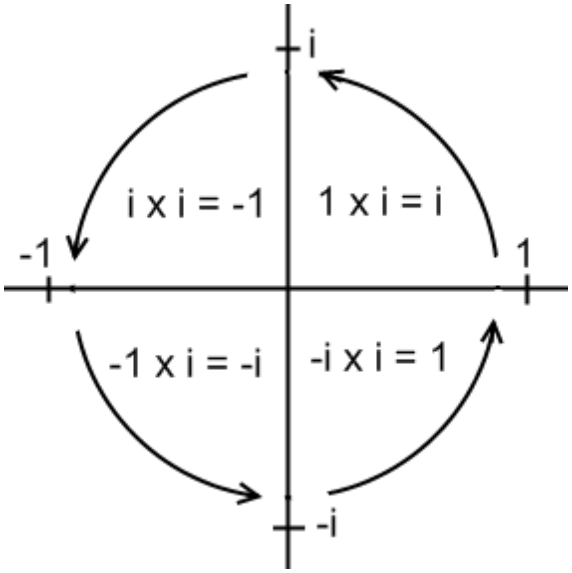

Figure 4 – WICK ROTATION: "The complex plane reveals i's special relationship with cycles via the circle of i, also known as Wick rotation. Whenever a point on the complex plane is multiplied by i, it moves a quarter rotation around the origin or center of the plane." (14)

Supersymmetry (SUSY) proposes a relationship between bosons and fermions. Some scientists believe supersymmetry is a failed theory. A new approach would be proposing that the Mobius strip is a fundamental constituent of not only fermions (particles of matter) but also of bosons (particles of energy) - and therefore unites all particles.

The inner and outer surfaces of a Mobius form a continuous strip in space – unification of space with time requires a temporal continuity. This is carried out by Wick rotation's continuous cycling between Fig. 4's horizontal x-axis of real time and its vertical y-axis of imaginary time. Therefore, the Mobius

strip combined with Wick rotation and imaginary time provides a modern way to unite space, time, and other dimensions into one space-time. (The continuously curved Mobius surface + continuous Wick rotation = curvature of space-time.)

Informally - if an object in space consists of one piece and does not have any "holes" that pass all the way through it, it is called simply connected. A doughnut (and the figure-8 Klein bottle it resembles) is “holey” and not simply connected (they're multiply connected) Referring to the infinite universe (see text associated with Figure 3) - a flat universe that is also simply connected implies an infinite universe. (15) So it seems the infinite universe cannot be composed of subunits called figure-8 Klein bottles. But the changing of the Klein bottle’s shape by binary digits composing photons and gravitons mimics the process of gaps in, or irregularities between, figure-8 Klein bottles being “filled in” by binary digits in the same way that computer drawings can extrapolate a small patch of blue sky to make a sky that’s blue from horizon to horizon. This ensures the positive and negative shapes in different figure-8 Klein bottles are precisely joined, and makes space-time relatively smooth and continuous as Einstein thought. Plus - it gets rid of holes, making figure-8 Klein subunits feasible as building blocks of infinity.

Returning briefly to the topic of Wick rotation (as well as mentioning dark matter and dark energy) -

Many people believe the reason a jet aircraft is propelled forward is because its exhaust pushes against the air outside. This cannot be the reason a spaceship moves forward in the vacuum of space where there is no air. The spaceship's movement is attributed to Isaac Newton’s 3rd law of motion (to every action, there is an equal and opposite reaction). But what exactly is the 3rd law? Does it need to simply be accepted as a mysterious abstraction which "just is" the way things work? Could there be an explanation in physics for why a rocket in space behaves the way it does? Planets, stars, galaxies are – everything is - constantly in motion. In an infinite universe existing eternally, and where all space-time is entangled, (16) that motion guarantees any point in the remotest depths of space would have once been (or will be) occupied by dense matter for the rocket's exhaust to push against. If the rocket fuel and exhaust is composed of gravitational and electromagnetic waves which have components going back in time, the exhaust must inevitably and perpetually push against some form of dense, undetectable (dark) matter.^

^ Since time can’t exist separately from space, this matter in another time would actually be matter in another space-time. The extra-dimensional space-time can be unified with this dimension by two methods - a) in the same way that BITS (electronic BInary digiTS) make the many objects in a computer image seem to be separate when they’re really connected, and b) by reversal of the direction of Wick rotation, which allows “advanced” waves that travel back in time to cancel the “retarded” waves going forwards in time, and to produce quantum mechanics’ entanglement. This means “... ‘dark matter’ might be just ordinary matter”, which was suggested by Nima Arkani-Hamed

in an interview about his paper. (17) The only difference between them would be that dark matter is, to use Wick rotation, rotated 90 degrees from ordinary matter's horizontal x-axis to the vertical, "imaginary" y-axis. It's rotated into another dimension. Since this rotation twists the electromagnetic spectrum perpendicular to our perceptions and instruments, the dark matter is only detectable gravitationally (because it still resides in space-time and General Relativity says gravity is space-time). Though unified with this dimension, it may be visualized as existing "above" and "below" ordinary space-time**:** in "hyperspace" and "subspace". Following Einstein's $E=mc^2$, (18) the relation between Dark Matter (DM) and its associated Dark Energy (DE) would be $DE=DMc^2$.

Section 4 -
CREATION OF THE COSMOS USING BITS, PI AND IMAGINARY TIME

Most scientists don't believe there can be a rational explanation for an infinite, eternal universe. They much prefer ideas like the Big Bang, the multiverse and random quantum fluctuations causing everything to pop into existence from nothing. Our concept of time as something that only goes from past to future makes the thought of creating an infinite, eternal cosmos unacceptable – a paradox which is seemingly absurd. But as 20th-century Danish physicist Niels Bohr said, "How wonderful that we have met with a paradox. Now we have some hope of making progress." If he's correct, then this article's ideas about the universe may, when investigated, turn out to be valid.

Imaginary time - which is as real to physicists and mathematicians as our familiar real time - obtained its name because it was originally a purely mathematical representation of time which appears in some approaches to the special relativity and quantum mechanics theories developed in the early decades of last century. We can picture imaginary time in the following way. One can think of ordinary, real, time as a horizontal line. On the left, there's the past - and on the right, the future. But there's another kind of time in the vertical direction. This is called imaginary time (it's described with imaginary numbers such as i which equals √-1). Professor Paul Davies writes,

'The name has stuck, even though today we accept imaginary numbers are just as real as real numbers.' (19)

In the unification of a quantum gravity universe, the real and imaginary would be connected. Like the surface of the Earth, imaginary time has no boundaries (you can go around the world without falling over any edge) but, also like Earth, it is finite unless pi or another infinite number is incorporated into each and every part - numbers could be encoded into parts using the BITS (BInary digiTS, 1's and 0's) of electronics. Dr. Andrea Alberti of the Institute of Applied Physics of the University of Bonn says, 'Quantum mechanics allows superposition states of large, macroscopic objects. But these states are very fragile, even following (a) football with our eyes is enough to destroy the superposition and (make) it follow a definite trajectory.' (20)

So although we only see one Earth; it's within the realm of possibility that it, and everything else, is not finite but is infinite and superposed and actually existing in more than one place - even everywhere in spacetime. The condition of everything being infinite, superposed and existing everywhere/everywhen in space-time completely removes the need for cosmic expansion from a Big Bang. It sounds very strange because every object and event anywhere in space or time would be entangled with and capable of affecting any other object/event. However, it might add some common sense to quantum mechanics which has been repeatedly verified by experiment but makes no sense at all if we cling to the notion of finite, separate objects and events.

The existence of Earth and everything else in every spot and time is consistent with a never-ending number of Cosmic DVD's extending infinitely in every possible direction, and any object's position not being restricted to any one DVD. The above need not violate Pauli's exclusion principle which says that two similar particles of matter cannot have both the same position and the same velocity. If electrons on different Cosmic DVDs occupy the same position, they must have different velocities. This strange state could give rise to the false idea of a multiverse - other universes with different laws of physics existing alongside ours.

A model of the cosmos might be built that uses pi and imaginary time, and resides in Virtual Reality (an artificial, computer-generated simulation or recreation of a real life environment or situation). If the entire past and all of the future co-exists with our present, entanglement in the simulation is unable to remain separate from the quantum-mechanical and macroscopic entanglement existing in our perceived reality because imaginary time removes all boundaries between the two universes. They naturally merge, influencing each other and becoming one Augmented Reality (a technology that layers computer-generated enhancements atop an existing reality in order to make it more meaningful through the ability to interact with it). The poorly-named imaginary time of physics and mathematics unites with pi (both are necessary to generate an infinite universe - alone, unbounded imaginary time is finite).

As suggested by Elon Musk (founder of a number of high-profile companies, such as Tesla and Space X) -

"*If you assume any rate of improvement at all, then the games will become indistinguishable from reality, even if that rate of advancement drops by a thousand from what it is now. Then you just say, okay, let's imagine it's 10,000 years in the future, which is nothing on the evolutionary^ scale.*
So given that we're clearly on a trajectory to have games that are indistinguishable from reality, and those games could be played on any set-top box or on a PC or whatever, and there would probably be billions of such computers or set-top boxes, it would seem to follow that the odds that we're in base (non-simulated) reality is one in billions." (21)

^ Evolution doesn’t 100% compute with this article. Evolution would always exist in the forms of adaptation and of modification to anatomy/physiology, but it would not explain origins. Consider the future revolution of time travel combined with the unimaginable biotechnology and genetic engineering of centuries to come. Isn't it conceivable that plants, animals and even humans are the product of entirely natural intelligent design by humanity of the distant future? Making production a two-way process is the fact that humans of the distant future rely on the reproductive instincts of past and present men and women for their existence.

Prof. Stephen Hawking says that boundaries and singularities exist in real time but don't exist in imaginary time. (22) There really are boundaries in real time and it must hypothetically be possible to step outside the universe if only real time exists. But when so-called imaginary time also exists, it is not possible to step outside the universe because the boundaries simply aren't there and the universe has no end or start (neither in space nor in time). Only one universe can then exist, and there is no multiverse.

Conclusion

The greatest obstacle to understanding the cosmos, and beginning the journey to the union of quantum mechanics with General Relativity (quantum gravity), will be the human reluctance to accept a paradigm shift to determinism – and the human timidness resulting in the inability to conceive of the universe being generated by innumerable centuries of progress in computer / holographic science, and actually constructed of maths. While determinism leaves open the possibility that God exists, it doesn’t necessarily mean there’s a divine being. In a science TV program (23), Dr. Graham Phillips reported that
"the physicist and writer Paul Davies thinks the universe is indeed fine-tuned for minds like ours. And who fine-tuned it? Not God but minds from the future, perhaps even our distant descendants, that have reached back through time ... and selected the very laws of physics that allow for the existence of minds in the first place. Sounds bizarre, but quantum physics actually allows that kind of thing."
(Author comment – maybe the term God should be redefined to mean “our distant descendants, that have reached back through time …" Their population of billions would know how to apply the laws of quantum gravity to become omnipresent in space-time as well as other dimensions, and to become omnipotent and omniscient. They could then constitute the Elohim - a name used for God in the Old Testament which, according to World Book Encyclopedia, means the PLURAL MAJESTY OF THE ONE GOD.) (24)

This article is important and requires consideration because both theoretical and experimental physics have uncovered extremely powerful science in the past hundred years which needs to be recognized as susceptible to other interpretations. These other interpretations refer to the

outgrowths of General Relativity, quantum mechanics and Unification known as the relationship between gravity and matter**;** the Higgs boson and field**;** the subatomic nuclear forces**;** and universal expansion from the Big Bang. These other interpretations must, of course, be consistent with known data – but the very fact that they exist would stop science from falling into the dead-end of believing current interpretations are correct because they're the only ones that can exist. Such belief prevents any possibility of progress and is the trap that religions fell into. Nobody wants science to become nothing more than dogma and creation myth. While there may be parts of this article that will be seen as too speculative, the speculation is purely scientific and could turn out to be correct. Some readers will find parts of this article to be deficient in experiments and equations. We could do much worse than leave the last word to Einstein. He's reported to have said that if an author can't explain a theory to a six-year-old, that author doesn't really understand the theory himself or herself.

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COMPARATIVE ORAL DULOXETINE, MELATONIN AND TAPENTADOL FOR POST SPINAL ANALGESIA AND SEDATION IN KNEE ARTHROSCOPIC SURGERIES

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ABSTRACT:

Background: Arthroscopic knee surgeries are very common procedures as ambulatory day case surgeries and are preferred by most patients. Many patients complain of moderate to severe pain 24 h after surgery and pain affects the patient's activity level and satisfaction. Post-operative pain is a frequent observation in patients undergoing knee arthroscopic surgeries and remains a challenge to anaesthesiologist. Objective: To assess the efficacy of preoperative duloxetine, melatonin and tapentadol for post spinal analgesia and sedation in knee arthroscopic surgeries. Methods: This prospective, randomized study was conducted at Anesthesia Department, Rahat Anwar Hospital, Band Road, Chandmari, Barishal, Bangladesh from June-2021 to December 2022. After Institutional Ethical Committee clearance and written informed consent in 106 American Society of Anesthesiologists (ASA) I and II patients of either sex between 18-60 years of age, posted for knee arthroscopic surgery under spinal anesthesia. Patients undergoing knee arthroscopic surgery requiring spinal anaesthesia were allocated randomly to four groups of oral Placebo Group A, 20 mg Duloxetine Group B, 3 mg Melatonin Group C, 100 mg Tapentadol Group D, 90 minutes before surgery. We assessed block characteristics, intraoperative sedation using Ramsay sedation scores, postoperative pain scores using Numeric Rating Score, time to use of first analgesic, 24-hours analgesic consumption, additional analgesic consumption and any adverse effects. Results: Total 106 patients Spinal anaesthesia was successfully performed. No significant difference in age, sex, weight and duration of surgery were found among the groups. Time to first post-operative analgesic request (477.96±97.85 min) and total diclofenac consumption (111.25±50.78mg) was significantly longer in Group D compared to Group A. Although post-operative pain assessed by NRS (numerical rating scale) was significantly lower in Group D as compared to Group A, B and C at 2 hours after surgery, no significant difference was observed at any time point among groups. Mean duration of post-operative analgesia was 477.96±97.85 minutes in Tapentodol Group (p value<0.001). Total 24 hours diclofenac consumption is minimum in Tapentodol Group (p 0.04). No statistical significant differences were present in the onset of the spinal block and Ramsay Sedation Score among the Groups. Conclusion: Preoperative

administration of oral tapentadol provides prolonged analgesia with reduced 24-hours analgesic consumption.

KEYWORDS:
Tapentadol, Melatonin, Duloxetine, Spinal Anaesthesia.

INTRODUCTION

Arthroscopic knee surgeries are very common procedures as ambulatory day case surgeries and are preferred by most patients [1]. Many patients complain of moderate to severe pain 24 h after surgery [2,3], and pain affects the patient's activity level and satisfaction [4]. Subarachnoid block is undoubtly a preferred technique for lower limb surgeries. Knee arthroscopy is a common orthopedic surgery on lower limb that has been performed as a day care procedure for more than two decades. Activation of a specialized nerve ending "nociceptor" initiates pain in response to various stimuli (mechanical chemical, or thermal) directly through trauma or indirect via biochemical mediators from tissue damage; Arachidonic acid, histamine, prostaglandins, serotonin, and bradykinins are the common mediators that stimulate and upregulate nociceptors and augment pain process, so long duration of the stimulus leads to more mediators release, more receptors stimulation, and more pain sensation [5,6]. Despite advances in understanding pathophysiology of pain, half of the patient still experience post-operative pain. Tissue injury as a result of surgery sensitizes the neuroreceptors present peripherally resulting in central neuronal sensitization; consequently, causing nociceptive pain [7]. Multimodal analgesia uses the synergistic effects of different pain-relieving drugs to decrease postoperative pain with fewer narcotic requirements and fewer adverse effects [8,9]. Different adjuvants are utilized to extend the duration of spinal anesthesia, reduce postoperative pain, and decrease analgesic needs after surgery [10,11]. Pain after arthroscopic procedures such as knee arthroscopic surgeries can be severe which is not only undesirable rather associated with delayed recovery after suboptimal treatment. Pain control after knee arthroscopic surgeries is a challenge to anaesthesiologist. Although many therapeutic interventions including oral administration of melatonin, duloxetine and tapentadol as premedicant before spinal anaesthesia have been evaluated in various surgeries to enhance post-operative analgesia.Melatonin is reported to mediate analgesic action via action on receptors inside dorsal horn of spinal cord and gabaergic receptors [12]. Duloxetine a newer antidepressant inhibits serotonin and norepinephrine reuptake which are responsible for modulating descending inhibitory pain pathway in CNS [13]. Tapentadol is centrally acting opoid inhibits norepinephrine reuptake and activates α2 receptors and hence responsible for its analgesic properties [14]. Although studies suggest that these drugs play a role in central and peripheral pain modulation mechanism, existing literature is sparse in assessing the best agent among the three for decreasing the postoperative pain in orthopedic surgery.

MATERIALS AND METHODS

This prospective, randomized study was conducted at Anesthesia Department, Rahat Anwar Hospital, Band Road, Chandmari, Barishal, Bangladesh from June-2021 to December 2022. After Institutional

Ethical Committee clearance and written informed consent in 106 American Society of Anesthesiologists (ASA) I and II patients of either sex between 18-60 years of age, posted for knee arthroscopic surgery under spinal anesthesia. Exclusion Criteria's included patient refusal for the spinal block, known allergy and contraindication to study drugs. Contraindication to spinal anesthesia, BMI >30 kg/m2, history of preoperative intake of with SNRI or analgesics (excluding acetaminophen and non-steroidal anti-inflammatory drugs), patients requiring bilateral surgery, history of alcohol or drug abuse, Pregnant patients. All patients fulfilling inclusion criteria were thoroughly assessed and examined in the preanesthetic clinic. The patients were explained the study protocols along with 11-point numeric rating scale (NRS). The drugs were administered according to group allocation by assigned nurse in ward with no further involvement in the study. Drug was administered 90 min prior to surgery with sips of water as-

Group-A Placebo Empty capsule
Group-B 20 mg Duloxetine
Group-C 3mgMelatonin
Group-D 100mgTapentadol Group

Patients in all the groups were kept fasting for solids for 6-8h and received oral alprazolam 0.25mg night. In the operating room, routine monitors such as Non Invasive Blood Pressure (NIBP), Pulse oximetery(SpO2), Electrocardiogram (ECG).

Ramsay sedation: After securing the intravenous line the patients were preloaded with 500 ml Ringer Lactate followed by administration of spinal anesthesia with 3 ml of 0.5% heavy bupivacaine mixed with 25 µg fentanyl utilizing 25G Quincke's needle in L3-L4 intravertebral space. Time taken to achieve the sensory and motor block height of T10 or above was noted. Bromage score was used for assessing motor blockade and pin prick sensation for sensory blockade. Initial values of Ramsay sedation scores were noted. Ramsay sedation values, NIBP, HR were recorded every 2 min for first 15 minutes of spinal administration and thereafter every 10 minutes up to 105 mins then every 15 mins till the end of surgery by anaesthesia consultant not involved in the study. At the end of surgery, the level of sensory and motor blockade was checked by pin-prick method and the Bromage scale. The patients were shifted to post anaesthesia care unit(PACU).The pain was assessed on a 11 point by Numeric Pain Rating Scale(NRS) and analgesic was administrated when NRS>4 in the form of inj. Diclofenac 75 mg intravenous as a bolus over 10 sec for next 24 hours. In the PACU, NRS, sensory level and motor blockade checked at 0 hours, 2 hours, 4 hours, 12 hours, 24 hours postoperatively by the anesthesiologist posted in post anaesthesia care unit who was blinded to the drugs given as a part of study. The time of bromage 0/1, for demand of the first dose of analgesia in PACU was noted. Additional analgesic in form of injection tramadol was given if pain still not relieved or NRS>4 after 15 minutes with injection diclofenac. The time to first rescue anaelgesic, total consumption of tramadol and the presence of side effects such as if any were noted and managed. The primary outcome measure was the total diclofenac requirements in 24h after surgery. The secondary outcome

measures was post-surgery pain score in form of NRS scoring noted at 0,2,4,12,and 24 hrs and intraoperative sedation usingRamsay sedation monitoring.

Statistical analysis: The data generated in the study is presented as Mean ± standard deviation (SD), median and range, frequency, ratio and percentage. The data was analysed for statistical analysis using Microsoft Office Excel 2010 and SPSS IBM version 22. Normally distributed continuous variables were compared using analysis of variance ANOVA (analysis of variance).The Kruskal Wallis test was used for variables that were not distributed normally and further comparisons done using Mann Whitney U Test Categorical variables were analysed using the chi square test.

RESULTS

Table-1: Demographic profile of the study patients.

	Group-A (n=28)	Group-B (n=24)	Group-C (n=26)	Group-D (n=28)	p value
Gender M:F	3:25	8:16	6:20	6:22	
Age (in years)	29.35±10.35	29.35±10.35	31.25±11.11	30.87±11.19	0.881
ASA (I:II)	26:2	22:2	25:1	27:1	
Weight (in Kgs)	62.35±6.68	58.81±6.88	60.75±9.43	62.19±9.24	0.342
Duration of surgery(min)	118.12±40.02	116±32.08	122±28.16	120±24.16	0.802
Time to First post op analgesia(min)	377.25±52.58	430.65±84.84	410.71±65.20	477.96±97.85	<0.001
Diclofenac consumption (mg)	150 ± 64.2	115.7 ± 43.3	128.5± 64.0	111.25±50.78	<0.001

- Data are presented as mean ±SD: Statistically significant difference (p-value<0.05)
- High statistically significant difference (p-value <0.005)
- Duration of post-operative analgesia and diclofenac dosage used were comparable among Group B, C and D.

Total 106 patients Spinal anaesthesia was successfully performed. No significant difference in age, sex, weight and duration of surgery were found among the groups.Time to first post-operative analgesic request (477.96±97.85 min) and total diclofenac consumption (111.25±50.78 mg) was significantly longer in Group D compared to Group A (Table-1). Although post-operative pain assessed by NRS (numerical rating scale) was significantly lower in Group D as compared to Group A, B and C at 2 hours after surgery, no significant difference was observed at any time point among groups (Table-2).

Table 2: NRS Score.

Group-A (n=28) Median(IQR)	Group-B(n=24) Median(IQR)	Group-C (n=26) Median(IQR)	Group-D (n=28) Median(IQR	P value
T'0	3(3-4)	2.5(2-3)	3(2-3)	1(0-2) 0.624
T'2	3(3-4)	3(2-3)	3(2-3)	2(2-3) 0.001
T'4	2(2-3)	2(2-3)	2(2-3.75)	3(2-3) 0.861
T'12	3(2-4)	3(2-3)	2(2-3)	3(2-4) 0.939
T'24	2(2-3)	3(2-3)	3(2-3)	3(2-3) 0.607

*IQR = Interquartile Range The above table shows post-operative NRS at 0hr,2hr,4hr,12hr,24hr respectively.

Figure 2: Comparison of means of Ramsay sedation values at different time intervals among the groups.

Comparison of means of Ramsay sedation score is shown among the groups. No significant difference was observed among the groups (Figure-2).

Table-3: Tramadol Consumption in 24 Hours as Additional Analgesic.

GROUPS	Total				
Group-A	Group-B	Group-C	Group-D		
No of tramadol used in 24 hrs (in mg)			0mg	25	22	24	27	98
100mg 2	2	2	1	07				
200mg 1	0	0	0	01				
Total	28	24	26	28	106			

Table-4: Incidence of intraoperative complications.

Group-A	Group-B	Group-C	Group-D	
Bradycardia	2	0	0	0
Hypotension	6	0	2	0
Nausea	2	0	0	2
Vomiting	0	0	3	1
Respiratory depression		0	0	0	0
Pruritis	0	1	0	0
Shivering	3	2	2	0

Tramadol as additional analgesic was needed in different groups. No patient required 200 mg tramadol except in Group A were one patient required (Table 3). Intraoperative complications observed are shown in Table 4. Hypotension was the commonest complication observed in Group A.

DISCUSSION

Our results showed that the effect of duloxetine on the onset (as primary outcome) and duration of the spinal blockade were statistically non-significant; also, duloxetine delayed the time to the first dose of rescue analgesia request about double the time and maintained VAS score in the lower range in comparison to control group; frequency and total morphine consumption (half the dose) were less in duloxetine group when compared to placebo up to 24h as a secondary outcome. No significant differences in adverse effects were observed between the duloxetine group and placebo with consideration of prophylactic ondansetron for postoperative nausea and vomiting (PONV). Our study demonstrated that a single dose of 100 mg oral tapentadol preoperatively is more effective in decreasing the pain severity and postoperative analgesic requirement without adverse effects in patients undergoing knee arthroscopic surgery. Total 106 patients Spinal anaesthesia was successfully performed. No significant difference in age, sex, weight and duration of surgery were found among the groups. Time to first post-operative analgesic request (477.96±97.85 min) and total diclofenac consumption (111.25±50.78 mg) was significantly longer in Group D compared to Group A. Although post-operative pain assessed by NRS (numerical rating scale) was significantly lower in Group D as compared to Group A, B and C at 2 hours after surgery, no significant difference was observed at any time point among groups. Orthopedic procedures such as arthroscopic surgeries are associated with moderate to severe pain along with psychological distress in the post-operative period hence necessitating active intervention [15]. The preemptive analgesic effect of oral melatonin, duloxetine and tapentadol has been previously studied independently in a variety of surgical procedures. To the best knowledge, this is the first study to compare these drugs in a single setting. In our study, drugs dosage, and timing of drug administration were selected as per previous studies to prevent the establishment of central sensitization evoked by the incisional and inflammatory injuries occurring during surgery. Our study drugs had no effect on block characteristics in terms of onset and height of block but enhanced motor block is observed significantly in tapentodol group. Role of preemptive analgesia has been documented in attenuation of post-operative pain [16]. Ramsay sedation score dropped to around 85 in all groups after 30 minutes of subarachnoid block although we did not find any significant difference in Ramsay sedation values between different groups. The use of lower dosages of drugs could have the reason attributed to this finding. Ben et al [17] concluded in their study that patients under spinal anaesthesia show significant sedation only after achieving high sensory block. This is in correlation with study by Evagelidis P et al [18] who did not find any difference in Ramsay sedation values even with sublingual 9 mg melatonin. The other reason may be the same median and anaesthetic block height achieved in the groups. Our study showed decreased 24 hours diclofenac consumption in all study drugs groups compared to placebo. Significantly reduced in tapentodol group (p value 0.04).Tapentadol, an opioid owing to its dual mode of action (μ-receptor agonist/ norepinephrine reuptake inhibitor) increased time to first analgesic use, reduced postoperative analgesic consumption without any side effects of opioids. Tapentodol decreased induction dose requirement, postoperative analgesic requirement in surgical patients [19]. Similarly, reduced postoperative dose requirement was observed by Daniels SE, 2009; Hatrick[20,21]. Yadav G et al [22] reported significant decrease inpain score and analgesic requirement in laparoscopic

cholecystectomy patients. Antinociceptive actions of melatonin have been well demonstrated in various studies [7]. The anxiolytic action of melatonin is directly correlates to its pharmacokinetics, time required to reach peak plasma concentration of drug ranged from 0.25h to 13h. The postoperative analgesic effect of melatonin has been proved with cataract surgery under topical anaesthesia and with laparaoscopic cholecystectomy [23]. Melatonin impact on pain may be due to interplay between the melatonergic and GABA-ergic systems, enhancement of endorphin levels and the antinociception induced by opioid receptor agonists, and activation of MT2 melatonin receptors in the dorsal horn of the spinal cord [24,25]. Yousaf et al [26] in studies showed an opioid-sparing effect or reduced pain scores with melatonin premedication whereas three studies were contradictory. In our study none of the patients had respiratory depression, 8 patients had hypotension, 2 patients had bradycardia and 3 patients had shivering in Group A where as in 2 patients hypotension was observed in Group C. Pruritis was seen in 1 patient whereas shivering was observed in 2 patients each in Group B and Group C. Nausea was found in 2 patients receiving Tapentadol and vomiting was seen in 3 patients of Group C and 1 patient in Group D. This study had few limitations such as smaller sample size and unequal distribution of patient in the groups. As it was not the crossover study the influence of inter patient variably could not be avoided during the comparison. Secondly, we did not measure the serum level of study drugs, as existing literature mentions that smoking lowers duloxetine serum levels thus requiring high dose to achieve therapeutic level, but we did not look into this aspect in our study. Majority of studies of duloxetine are done in spine patients with drug started preoperatively one to two week prior to surgery and continued postoperatively.

ELECTRONIC BANKING AND CUSTOMERS' SATISFACTION: A STUDY OF SELECTED DEPOSIT MONEY BANKS IN AWKA, ANAMBRA STATE

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A B S T R A C T:
This study examined the effect of electronic banking on customers' satisfaction in Awka, Anambra State of Nigeria. The study specifically examined the effect of electronic banking service quality on customers' satisfaction as well as correlation between electronic banking service dimensions and customers' satisfaction. The work adopted a survey approach, and a total of two hundred and eighteen (218) questionnaires containing ten (10) questions were distributed to selected respondents who are customers of the banks. Two hundred (200) questionnaires were completed and returned. Data collected were analysed using percentages and Likert scale. The responses were further analysed using ordinary least square regression and Pearson correlation analysis. The results of the analyses revealed that electronic banking proxied by customers' knowledge of e-banking service, availability and improvement of account movements has no significant effect on customers' satisfaction, electronic banking service quality surrogated by service delivery, ease of use and reliability has significant effect on customer's satisfaction. The finding also shows that there is a positive and statistically significant correlation between electronic banking dimensions and customers' satisfaction. Based on the findings, banks should add other e-banking service delivery channels like mobile banking and internet banking in addition to existing delivery channels, also try to provide e-banking service for other types of account holders and encourage customers to use Point of Sale (POS) terminals and Automated Teller Machines (ATMs) as currently been practised in which withdrawal below N100, 000 are done through ATMs.

KEYWORDS:
Electronic banking; deposit money banks; customers' satisfaction.

INTRODUCTION

Information and communication technology has tremendously changed the conduct of banking business in Nigeria. Three decades ago, banking business was a simple business; consumers saved their money and received their financial services from banks. When customer open savings account, they receive passbook from the bank with which the account would be operated; and when it is a current account, they receive cheque book for the same purpose. Today, the banking industry has moved into an arena of menu-driven ultra-robust specialized software programmes often referred to

as banking applications. These applications can carry out virtually all banking functions relying heavily on information collection, storage, transfer and processing. The application of electronic banking products or services have become a subject of fundamental importance and concerns to all banks operating in Nigeria and indeed a condition for local and global competiveness [1,2]. The consolidation exercise of the Nigeria banking industry in 2005 has drawn the attention of many banks to application of various technological devices in promoting/achieving better customer service delivery that guaranteed customer satisfaction that translate into increase in profitability and higher return on investment.

Customer satisfaction holds the potential for increasing an organization's customer base, increase the use of more volatile customer mix and increase the firm's reputation. As a result, obtaining competitive advantage is secured through intelligent identification and satisfaction through better products/services. Technology is then essential in providing faster and more efficient services to customer-friendly solutions. According to Marete, Gommans and George [3], technology adoption by the banks has enabled the use of different technology tools in banking, which together may be categorized under a broad umbrella of electronic banking. With globalization, Nigerian banks have no option but to adopt electronic banking services to enhance effective service delivery that transcends to customer satisfaction, if they really want to stay in the business race, let alone be profitable [4].

Customer satisfaction is a key factor determining how successful organization and customer relationship will be. The significant growth of the Internet is changing the way organizations conduct business with consumers. Banking industry is no exception. Banks invest huge amount of money in electronic banking infrastructures thus, in order to return the investments and a lead sustainable business, it is essential to provide high service quality that fulfils customers' expectations and builds loyalty. Hence, banks have to focus not only on customer acquisition but also on customer retention as loyalty fosters future purchase intentions and spreads positive word of mouth that has a huge impact on customer choice. Electronic banking is the brain child of Information and Communication Technology (ICT) that made it possible for service providers and their customers in developing countries to enjoy a good semblance of the services enjoyed in advanced countries of the world. Electronic banking services have afforded banks the opportunities to impress customers which encourage them to keep coming back. Today, it would be difficult to see any bank in the country that does not render one form of electronic banking service or the other, even banks in the most remote parts of the world.

Electronic banking is conducted by the customer instead of a bank teller, so there is no face-to-face interaction. The customers do not seek any additional services or help on by pro-actively contacting the bank. Some customers refuse to use these services because they feel they are entitled to in-person customer service. On the other hand, there are customer's complains on the issues with security and accuracy. These complain have made some of the customers not frequently use e-banks

and consequently lead to an increase of queue inside a bank. Queue inside a bank has led to unnecessary overcrowding of customers inside a bank which affects performance of the bank.

Over time, more and more concerns are associated with electronic banking, as the industry branched out to phone and on line banking. However, regardless of the benefits obtained from e-banking, e-banking poses some risks to the banks and banking customers who choose to use it. Customers have to weigh these risks against the potential benefits before they decide whether Internet banking is a good option. Electronic banking lacks one thing most bank institutes thrive on customer service. Despite the effort of banks to ensure that customers reap the benefits of e-banking, the banks is met with complaints from customers as regards malfunctioning of Automated Teller Machine (ATM), network downtime, online theft and fraud, non-availability of financial services, payment of hidden cost of electronic banking like Short Message Services (SMS) for sending alerts. It seems that ignorance still exist about the banking business and customers on how to use some of these technologies, of course the use of technology forms the backbone for better result in banking and today's banking situation demands continuous innovation in order to meet the aspiration of increasing knowledgeable bank customers.

Objectives of the Study

1. To examine the effect of electronic banking on customers' satisfaction with regards to customer knowledge about e-banking, availability and improvement of account movements.
2. To assess the effect of electronic banking service quality on customers' satisfaction.
3. To determine the correlation between electronic banking service dimensions and customers' satisfaction.

The other sections of this paper is organized as follows: section two provides the review of related literature; section three envisages the methodology approach; section four discusses the result of the analysis, while section five articulated conclusion and policy implications.

REVIEW OF RELATED LITERATURE

The concept of electronic banking has been defined in many ways. Daniel [5] defined electronic banking as the delivery of banks' information and services by banks to customers via different delivery platforms that can be used with different terminal devices such as a personal computer and a mobile phone with browser or desktop software, telephone or digital television. Pikkarainen, Karjaluoto and Pahnila [6] defined internet banking as an internet portal, through which customers can use different kinds of banking services ranging from bill payment to making investments". With the exception of cash withdrawals, internet banking gives customers access to almost any type of banking transaction at the click of a mouse [7]. Indeed the use of the internet as a new alternative channel for the distribution of financial services has become a competitive necessity instead of just a way to achieve competitive advantage with the advent of globalization and fiercer competition [8,9]. Such service

also saves the time and money of the bank with an added benefit of minimizing the likelihood of committing errors by bank tellers [10].

Customer satisfaction is a measure of how products or services meet or surpassed customer expectations. In a competitive market like the banking industry, it consists of various strategies aimed at keeping, meeting or exceeding customers' expectations. Saha and Zhao [11] see customers' satisfaction as a collection of outcome of perception, evaluation and psychological reactions to the consumption experience with a product or service. In other words, it is a result of a cognitive and affective evaluation where some consumption standard is compared to the actually perceived performance. Thus, if the performance perceived is less than expected, customers will be dissatisfied, and where the perceived performance exceeds expectations, customers will be satisfied and this would lead to positive behaviours or outcome [11]. A satisfied customer tend to be loyal, takes less time, are less sensitive to prices [9] and pay less attention to competitors advertising. Umorok as cited in Worku, Tilahunand Tafa [12] noted that satisfied customers would not only continue their patronage, but would keep on referring prospect to the firm and that such continuous patronage is likely to lower the retention elasticity of the firm. Therefore, understanding the level of customer satisfaction is important to the bank because satisfaction in consumer contexts amounts to beliefs and thoughts about the outcomes of purchasing. Satisfaction is also connected with emotions that accompany purchase outcomes and related events.

The Innovation Diffusion theory developed by Roger in 1983 explains individuals' intention to adopt a technology as a modality to perform a traditional activity. The critical factors that determine the adoption of an innovation at the general level are the following: relative advantage, compatibility, complexity, trainability and observability. It is concerned with the manner in which a new technological idea, artefact or technique, or a new use of an old one, migrates from creation to use. According to (IDT) theory, technological innovation is communicated through particular channels, over time, among the members of a social system. The stages through which a technological innovation passes are: knowledge (exposure to its existence, and understanding of its functions); persuasion (the forming of a favourable attitude to it); decision (commitment to its adoption); implementation (putting it to use); and confirmation (reinforcement based on positive outcomes from it) [10].

Khan and Alhumoudi [13] evaluated the performance of e-banking and the mediating effect of customer satisfaction using a structural equation model approach. The primary data were gathered from 287 participants. Stratified random sampling was used. Structure Equation Modelling (SEM), reliability, convergent, discriminate validity and model fitness were achieved through SmartPLS 3 (Christian M. Ringle, Germany). The findings reveal that efficiency, reliability and service quality have a significant direct effect on customer satisfaction and customer retention. It also shows the

significant effect of efficiency, reliability and service quality when using customer satisfaction as a mediator for customer retention.

Basir, Ramachandran, Ismail, Ismail, Ishak and Othman [14] assessed customer satisfaction with online banking services during a pandemic Covid-19. There are 322 sets of survey questionnaires with 38 questions that are constructed, distributed, and collected from respondents who are online banking users among youths. The regression analysis results showed the quality, security & privacy of services and convenience and customer's satisfaction towards online banking.

Almaiah, Al-Rahmi, Alturise, Alrawad, Alkhalaf, Lutf, Al-Rahmi and Awad [15] analysed the satisfactions and behavioural intentions of Malaysian customers in using Internet Banking, applying the Information System Success Model (ISSM) by the integration of adoption and application technology (UTAUT) theory. Some criteria, which were taken into consideration, are as follows: perceived Risk (PR), facilitating Conditions (FC), Price (PV), Performance expectancy (PE), Information Quality (IQ), Service Quality (SEQ), and System Quality (SQ). These aspects are important to measure customers' satisfaction and behaviour toward Internet and Online Banking. A sample of 362 valid responses, consisting of Malaysian customers who used E-Banking, was used for the purpose of data collection. The relationship between customers' satisfaction and factors influencing their contentment in using Online Banking was investigated. In order to evaluate this, a model called "Structural Equation Model (SEM)" was developed and used. Findings showed that most of the Online Banking users were satisfied with the system.

Reddy and Megharaja [16] examined the relationship between the dimensions of E-Banking service quality and customer satisfaction to determine which dimension can potentially have the strongest influence on customer satisfaction. The study followed the quantitative approach where a survey was distributed among bank clients in Lebanon and the data were analysed using SEM with AMOS. Findings suggest that the four hypotheses in this study were supported by the data, and the main contribution of this study was that reliability, as a service quality variable, was the main predictor of customer satisfaction in this particular market.

Purushothaman, Priyadharshini, Hemavathi and Gowrishankar [17] analysed the awareness and usage of internet banking among the account holders of SBI bank in Chennai region. The survey conducted among the account holders of SBI bank are majorly belong to business and trading firms. Totally 80 samples were collected using questionnaire method and used convenience sampling method for data collection. The various tools used in the study were Chi-Square, Correlation and Kruskal Wallis test. The result revealed that there is a significant relationship between E-payment systems saves the time and money and they are better than cash.

Omofowa, Omofowa, Nwachukwu and Le [18] examined the connection between Electronic Banking service quality and customer satisfaction. The study used a survey research approach. 344 participants were selected randomly for the study. The data from 302 respondents suggest that E-banking service quality dimensions (innovation, technology competence, reliability and tangibility jointly influence customer satisfaction. Further, innovation, technology competence, reliability and tangibility had positive and significant effects on customer satisfaction. The study concluded that deposit money banks must optimise their E-banking service to improve customer satisfaction.

K-12 ONLINE EDUCATION DURING COVID-19 PANDEMIC: PRIVATE SCHOOL TEACHERS' PERSPECTIVE

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A B S T R A C T:

Throughout the COVID-19 pandemic, most educational institutions had been compelled to make an abrupt transition to online classes, which provided opportunities and challenges for students and teachers. To make sure the validity and reliability of this research study, a descriptive design was used. The researcher utilized an online semi-structured interview to gather the needed data from the participants. The researcher adhered to random sampling in selecting the participants of the study. A total of 17 private school teachers were randomly interviewed using Google Meet and Zoom. After the online semi-structured interview, the researcher analyzed the data using thematic analysis. The three major themes generated from the responses of the participants are perceptions of the private school teachers, the challenges in online teaching amidst the COVID-19 pandemic, and coping mechanisms. The study found that online teaching had an impact on the responsibilities and roles of the participants in K-12 education due to the changes in teaching platforms, procedures, and techniques. The study presented that the internet connection of students and teachers is one of the most important tools in online teaching. This study revealed also that pure online teaching will not help K-12 education achieve its goals due to the lack of hands-on activities. The study highlighted that the various challenges in online teaching encourage them to be adaptable and resourceful in their teaching careers. Furthermore, the study consists of coping mechanisms that determine how the participants coped with the changes introduced by the rapid move from face-to-face delivery of lessons to online teaching. The researcher recommends that teachers must regularly attend training and seminars on educational development and students must interact with their teachers to perform effectively in the teaching-learning process.

K E Y W O R D S

Coping mechanism, COVID-19 pandemic, K-12 education, Online teaching, Private school teachers

INTRODUCTION

The COVID-19 pandemic is a classic adaptable and transformative challenge for teachers, with no preloaded blueprint to guide effective responses (Organisation for Economic Cooperation and Development, 2020). A year after COVID-19 pandemic began, approximately half of the world's students are still affected by partial or complete school closures, and over 100 million more students might decline below the essential reading competence level as a result of the pandemic crisis (UNESCO, n.d.). With the immediate shift from the physical classroom to the online classroom in

many parts of the world, some are wondering if online education implementation will continue post-pandemic, and how such a shift will influence the global education system (Li & Lalani, 2020). Due to the continued COVID-19 pandemic, all face-to-face classes were stopped under the concept of public distancing (Ferrel & Ryan, 2020).

Due to COVID-19 most educational levels should make an immediate transition to online education, which may be both a potential and a challenge (Toquero, 2020). As a result, some research has been conducted to investigate the need for urgent remote teaching during COVID-19 outbreak. Basilaia and Kvavadze (2020), conducted a study with 950 participants in which the Google Meet platform was used for online education. Their findings revealed that the quick transition to online education was a success and that the knowledge gained could be applied in the future. On the other hand, Owusu-Fordjour et al. (2020), conducted a study on 214 college students' web-based learning and revealed that the global pandemic had a negative influence on their learning because most of them were not used to studying efficiently at their own pace. In Cyprus, Souleles et al. (2020) believed that online education is not a replacement for current education-learning perspectives and that school discipline classifications must be recognized. Even though supplying hastily organized seminars to fill teachers' weak areas is a crucial component, it does not eliminate the need for ongoing training in both pedagogical and technological contexts (Wu S-Y, 2021). According to Adarlo and Jackson (2017), before the implementation of the K-12 educational curriculum, the Philippines' basic education required ten years of schooling: six years in elementary school and four years in high school. They also stated that, in response to other countries' social responsibility toward globalization, the Philippines had also initiated major educational reform plans to change and shift its 10-year basic education into the K-12 education program. The education policies' main features are prepared for higher education, admission to local and international institutions of higher learning, and immediate employment prospects after graduation (Okabe, 2013). According to Trance and Trance (2019), the Philippine Department of Education introduced the K-12 Curriculum for both elementary and high school levels of basic education at the start of the 2012-2013 academic year, and as a result, the current curriculum is to be developed continually. They also stated that this phase is associated with a flexible shift in many stakeholders' views, attitudes, and insights about the new program. They also stated that the study examined numerous witness statements of in-service and pre-service teachers and students in this area to gain an understanding of how they perceive the current educational framework. Since both teachers and students have had the chance to learn about and interact with technology in education such as mobile-based teaching, computer-based education, and online learning, the roadblocks to accessing online learning during the pandemic have been reduced (Pellegrini et al., 2020).

Mahyoob (2020), claims that the only option due to the severity of the situations prompted by COVID-19 pandemic was to transform to online education. He went on to say that one additional benefit of online teaching and learning is the key to enabling lectures when students demand to record their

lessons and teachers thoroughly evaluate and prepare for recording, which undoubtedly improves the teaching process and practices. COVID-19 pandemic has forced teachers to rapidly move their classrooms to an online environment (van der Spoel et al., 2020). Using communication and information technology in the classroom, according to studies, improves the educational process and increases students' active learning competencies (Jamieson-Procter et al., 2013). For most schools, technical difficulties have become a major demotivating factor for teachers and students, causing disruptions in the teaching-learning process (Ghavifekr & Rosdy, 2015). According to one study, some students preferred online learning since it is the most acceptable mode of providing education during a pandemic (Ragpala, 2021). However, even though online learning is more convenient, many students who are excelling in a traditional classroom environment (Kebritchi et al., 2017) are not equitably progressive in an online learning environment (Cheung & Kan, 2002). Teachers play a crucial role in the effective implementation of online learning (Orhan & Beyhan, 2020). Given that perceptions influence behavior, determining teachers' perspectives is essential to effective online education (Miglani & Awadhiya, 2017). The reliability of virtual learning applications influences people's perceptions of online education (Demirli, 2002). Recognizing teachers' perceptions and taking appropriate steps to improve system quality is critical (Birişçi, 2013).

The theory of change serves as the study's theoretical framework. A theory of change is a method for mapping programs that aim to induce change in a specific setting to increase their effectiveness (de Buck, et al., 2018). A Theory of Change is defined as a hypothesis about how a program provides its influence (Scriven, 1991). The theory of change encompasses both the process and the product (Vogel 2012). The theory of change, according to The Center for Theory of Change, Inc. (n.d.), is a detailed statement and show of strength of how and why the proposed changes are supposed to happen in a particular context. They also stressed that it is associated with mapping out or "filling in" what has been referred to as the "missing middle" between how a program or change effort executes its activities or interventions and how they contribute to the accomplishment of desired results. This study is related to the theory of change since there is a substantial shift in the form of teaching and learning programs in K-12 education during COVID-19 pandemic. The reliance on digital applications in K-12 education was the change. Teachers must adapt to the many challenges of online teaching as the educational system evolves. A theory of change is a technique that evaluates how a certain activity or set of actions is likely to result in a significant development change based on a logical evaluation of available evidence (UNDAF, n.d.). With the studies mentioned focusing on the relationship of online teaching with teachers' involvement in the teaching and learning process, the researcher intended to determine the perceptions of private school teachers in online teaching for K-12 education as well as the various kinds of challenges that they experienced at the peak of COVID-19 pandemic. Furthermore, this research will add to the body of knowledge, particularly for other teachers who are dealing with similar challenges in online K-12 education. This research study will pave the way for improved and broader information to realize the Philippines' objective of K-12 education.

OBJECTIVES

The general aim of this study is to determine the perceptions of private school teachers in online teaching for K-12 education during COVID-19 pandemic. Particularly, it aims to address the following objectives:

1. Determine the perceptions of private school teachers in online teaching for K-12 education during COVID-19 pandemic.
2. Describe the challenges faced by private school teachers in online teaching for K-12 education during COVID-19 pandemic.
3. Determine the coping mechanisms of the private school teachers with the challenges identified.

METHODS

Design

The descriptive method was utilized in this study to gather information and data to better understand the research objectives. The goal of qualitative research is to develop information based on personal experience (Dela Fuente, 2021; Sandelowski, 2004). This design typically comprises searching the data inductively for repeating themes, structures, or ideas, and it characterizes and analyzes to capture the experiences of the participants. In this regard, the descriptive research design is most suitable for this study because the researcher gathers information to acquire a deeper knowledge of the participants, including their experiences and challenges during COVID-19 pandemic. The researchers gathered data qualitatively, inductively discovered repeating patterns, and then documented and interpreted those motifs. Furthermore, the study's design allows for a flexible approach. As a result, if crucial new issues and questions surface throughout the study, further analysis may be conducted.

Participants

In this research, purposive sampling was used in this study. Purposive sampling, according to Dornyei (2007), is a method for locating people who can offer rich and different views on the topic under inquiry to optimize what we may learn. This sampling tool was employed since the researcher relied on his judgment when selecting the participants of the study (Alchemer, 2021). The purpose of this study is to interview private school teachers to understand how they view online K–12 education in the context of COVID-19 pandemic. The participant's inclusion criteria are:

1. employed and full-time teacher in a private school;
2. at least one year of teaching experience;

3. have a bachelor's degree or 18 units in education;
4. have been teaching online when COVID-19 pandemic began;
5. have at least 30 students in their online class.

The number of participants was selected until the saturation point was reached. The number of participants in the study was ten (10) females and seven (7) males ranging in age from 24 to 40 years old, for a total of seventeen (17) private school teachers in the province of La Union, who are conducting online classes during the COVID-19 pandemic.

Ethical considerations

Informed consent was given to the participants before the online semi-structured interview. The researcher ensured that the participants are fully informed about the aim of the study in which they are being requested to participate and that they are free to leave the interview at any moment. The study considered the general guidelines in research ethics. The researcher followed all of the necessary procedures and standards for data collection. The researcher created a series of approval letters that were distributed to the research participants. It goes over the objectives, goals, and data confidentiality of the study to ensure that everyone is on the same page and understands everything. The researcher additionally enlisted the assistance of professionals by distributing validation letters for the research questions. Inputs and suggestions were taken note of, acknowledged, and incorporated into the study's progress. After all of the letters were approved, the researcher began collecting data. The participants were advised that the study was entirely voluntary and would have no impact on their lives as teachers, or even in their communities. Furthermore, the researcher assured the participants that their names and personal information, as well as their answers, would be kept private and that the material would be used solely for academic purposes; therefore, confidentiality was ensured.

Data collection

The study's participants were interviewed through an online semi-structured interview. The interview was conducted using online platforms such as Google Meet and Zoom. Due to the pandemic, collecting data online was the safest alternative for protecting the health of the researcher and the participants. The semi-structured interview was used in the study because it allows the researcher to capture the experiences of the participants expressed vividly during the interview (Dela Fuente, 2019). Participants may also be asked to clarify their responses, provide examples, and expand on what they have responded to.

PENGARUH SISTEM PEMBAYARAN NON TUNAI (M-BANKING) TERHADAP TINGKAT PERTUMBUHAN EKONOMI INDONESIA

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ABSTRACT:
This journal was created to analyze whether there is an effect of electronic money transactions, per capita income levels, and inflation on economic growth in Indonesia. The development system in the financial sector has transformed from cash payments to cashless payments. Initially, it was only limited to bank transfers through tellers. Then it developed through Automated Teller Machines (ATMs). Furthermore, with the increasing mobility of customers/community, banking devices are required to create products that have higher mobility, creating M-Banking (Mobile Banking), E-Banking (Electronic/Internet Banking), SMS Banking, and so on. This research is a quantitative research, the data is processed using Multiple Regression Analysis. The results of the study show that partially per capita income and inflation do not have a significant effect on economic growth but Electronic Money Transactions have a significant effect on economic growth. Simultaneously Per Capita Income, Inflation Rate, and Electronic Money Transactions have no significant effect simultaneously on the Economic Growth variable.

KEYWORDS:
Per Capita Income, Inflation Rate, Electronic Money Transactions, Multiple Regression Analysis

PENDAHULUAN

LATAR BELAKANG

Sistem pembayaran ialah sebuah sistem dari sebuah mekanisme yang dilakukan untuk memindahkan dana yang bertujuan penyaluran kewajiban dalam suatu kegiatan perekonomian. Pada dasarnya sistem pembayaran hadir ketika lahiran konsep 'uang' sebagai alat pertukaran (medium of change) atau intermediary dalam kegiatan transaksi serta keuangan. Adapun prinsip sistem pembayaran memiliki beberapa tahapan diantaranya: otoritas, kliring, serta penyelesaian akhir (settlement).

Adapun produk yang termasuk kedalam sistem pembayaran non tunai seperti Kartu (APMK), cek, bilyet giro, nota debit ataupun E-money (card based atau server besed). Adapun sistem pembayaran non tunai memiliki cakupan sistem yaitu transaksi ritel dan transaksi nilai besar (wholesale). Karakteristik dari transaksi nilai besar yaitu bersifat penting dan segera, ada keterkaitan transaksi antarbank, transaksi di pasar modal atau transaksi dengan total lebih dari Rp 1 Miliar.

Perangkat yang dijalankan pada aktivitas transaksi ini berupa Bank Indonesia Scripless Securities Settlement System (BI-SSSS) dan Bank Indonesia Real Time Gross Settlement (BI-RTGS). Sedangkan transaksi ritel merupakan transaksi antarperorangan dengan kisaran nilai kurang dari Rp1 Miliar.

Adapun media yang berpartisipasi dalam aktivitas transaksi ini berupa Sistem Kliring Nasional Bank Indonesia (SKNBI).

Keberhasilan dari sistem pembayaran yang berjalan stabil dan pesat akan menciptakan percepatan perekonomian di masyarakat. Yang tentunya akan berkontribusi pada pembangunan ekonomi nasional. Diimbangi dengan kemajuan teknologi yang mampu mewadahi kebutuhan akan proses digitalisasi pada sistem pembayaran non tunai di Indonesia yang tentu patut untuk diapresiasi dan diawasi perkembangannya agar tercipta kestabilan didalam sistem pembayaran non tunai nasional.

TINJAUN LITERATUR

Pertumbuhan Ekonomi

Pertumbuhan ekonomi sebuah sistem pasar yang bertujuan memproduksi kebutuhan penduduk sebagai upaya meratakan tingkat kemakmuran masyarakat. Masalah - masalah yang timbul dalam prekonomian disebut masalah jangka panjang (Sukirno). Sedangkan menurut pandangan Lincolin Arsyad, pertumbuhan ekonomi dikatakan dengan kenaikan GDP (Gross Domestic Product) tanpa harus melihat apakah kenaikan tersebut lebih besar ataupun lebih kecil dari tingkat pertumbuhan penduduk, atau apakah terdapat perubahan struktur ekonomi.

Adapun komponen dasar Yang diperlukan pertumbuhan ekonomi menurut Ali Ibrahim Hasyim, diantaranya (1) meningkatnya persediaan barang dan jasa akibat dari meningkatkan permintaan dari barang dan jasa tersebut, (2) kemajuan teknologi yang menjadi faktor utama drajat pertumbuhan sebagai penyedia barang yang dibutuhkan masyarakat, (3) masyarakat harus ikut serta menggunakan teknologi yang sesuai dengan perkembangan zaman agar tercipta inovasi dari penggunaan IPTEK. Selain itu para ahli menyebutkan beberapa faktor lama yang menjadi sumber dari keberhasilan pertumbuhan ekonomi, antara lain:

a) Sumber daya dan Tanah
b) Kualitas dan kuantitas sumber daya manusia dan angkatan kerja
c) Perkemahan teknologi dan modal
d) Lingkungan sosial dan perilaku masyarakatnya
e) Kondisi pasar sebagai tempat terjadinya pertumbuhan

Menurut para ahli klasik terdapat indikator-indikator yang mampu memberikan kontribusi terhadap tingkat pertumbuhan ekonomi, diantaranya kuantitas pendukung, kuantitas barang modal, luas kepemilikan tanah dan sumber daya dan kecanggihan teknologi. Meskipun terdapat beberapa faktor yang melatarbelakangi pertumbuhan ekonomi dari sudut pandang ekonomi klasik pertambahan penduduk menjadi aspek yang paling penting terhdap pertumbuhan ekonomi.

Tingkat Inflasi

Inflasi menurut Bank Indonesia keadaan meningkatnya harga kebutuhan dalam waktu berkala dan cenderung meningkatkan dalam jangka waktu tertentu. Apabila terjadi peningkatan harga pada satu atau dua barang tidak dapat dikatakan sebagai inflasi, namun bila peningkatan barang tersebut mempengaruhi harga barang lain, atau harga barang lagi juga ikut meningkat hal ini bisa dikatakan sebagai inflasi. Di Indonesia pengukuran tingkat inflasi dilaksanakan oleh Badan Pusat Statistik (BPS) dengan cara survei untuk menghimpun data harga dari berbagai barang dan jasa yang menjadi

makanan pokok di dalam masyarakat. Kemudian data yang diperoleh dibandingkan dengan harga barang dan jasa saat ini dan periode sebelumnya.

Menurut Iskandar Putong (2013) inflasi disebabkan oleh dua faktor, yaitu:

1. Demand Pull Inflation, keadaan dimana terjadi peningkatan permintaan namun tidak dapat dibarengi dengan peningkatan penawaran. Sehingga berdasarkan hukum permintaan, jika permintaan meningkatkan sedangkan penawarannya tidak berubah (tetap) maka dapat menimbulkan inflasi. Untuk mengatasinya para pelaku produksi dapat menambah tenaga kerja agar dapat memenuhi peningkatan permintaan tersebut
2. Cost Push Inflation, keadaan dimana terjadinya kenaikan ongkos produksi yang tejadi akibat peningkatan ongkos faktor produksi. dari keadaan ini dapat diatasi dengan beberapa cara, diantaranya melakukan perubahan harga produk menjadi lebih tinggi dari sebelumnya atau menurunkan kuantitas barang yang diproduksi.

Adapun klasifikasi Inflasi menurut Sukirno (2015) yang dibedakan berdasarkan besar-kecil persentase inflasi tersebut, sebagai berikut:

1. Inflasi berat, sebesar 30%-100% setahun
2. Inflasi medium, sebesar 10%-30% setahun.
3. Inflasi ringan, sebesar 10% setahun.

Pendapatan Perkapita

Menurut kajian yang dilakukan Samuelson (2017: 108) mengungkapkan, besaran gaji seseorang ataupun kelompok dalam masyarakat dari partisipasi, dari tenaga dan pikiran dari seseorang ataupun kelompok sehingga mendapatkan balas jasa. Pendapatan dapat diartikan sebagai seluruh harta yang dapat dipergunakan untuk memperoleh barang dan jasa dalam kurun waktu tertentu. Pendapatan memiliki arti sederhana ialah jumlah semua gaji, laba, bunga, sewa, dan bentuk penghasilan lain. Arti lainnya pendapatan ialah ukuran aliran (Case, 2007: 469). Pendapatan perkapita merupakan faktor turunan PDRB. Pendapatan perkapita juga dapat diperoleh dengan cara membagi jumlah PDRB dengan Jumat penduduk dalam kurun waktu dan wilayah tertentu 3. Adapun keuntungan yang diperoleh dari mengetahui pendapatan perkapita masyarakat, antara lain:

1. Menjadi alat ukur dan membandingkan tingkat kesejahteraan penduduk dari tiap periode ke periode lain
2. Digunakan sebagai data yang kredibel untuk membandingkan tingkat kesejahteraan antara negara.
3. Sebagai tolak ukurnya indeks pembangunan manusia disuatu negara.
4. Sebagai data yang kredibel untuk dijadikan bahan penyusunan kebijakan pemerintah. Dengan mengetahui besaran pendapatan perkapita dapat mempermudah kinerja pemangku kebijakan.

Transaksi E-money

Bank Indonesia melalui peraturan no.16/8/PBI/2014 mengungkapkan bahwa uang elektronik ialah alat pembayaran dalam media elektronik yang terdapat nilai dari sejumlah uang yang disimpan kedalam server atau chip. Adapun unsur-unsur dari uang elektronik yang diakui Bank Indonesia, seperti penyetoran sejumlah uang kepada penerbit sebelum menggunakan media elektronik, media elektronik menyimpan nilai uang dengan media server atau chip, uang elektronik dipergunakan untuk

bertransaksi dengan para pelaku ekonomi, uang yang terdapat dalam media elektronik bukan sebagai simpanan yang sudah atur dalam sistem UU perbankan (Bank Indonesia 2019)

Berdasarkan bentuknya E-money dua tipe, diantaranya:

1. Berbasis Kartu (Chip), uang yang disimpan dalam bentuk kartu yang dilengkapi dengan chip. Transaksi berbasis kartu dapat dilakukan secara offline. Nama lain dari e-money dalam bentuk kartu disebut kartu prabayar.
2. Berbasis Aplikasi (Server), uang elektronik dalam bentuk server dapat diakses dengan menggunakan internet. Aplikasi E-money menggunakan perangkat lunak khusus untuk menyimpan nilai. 5

HUBUNGAN TRANSAKSI UANG ELEKTRONIK DENGAN PERTUMBUHAN EKONOMI

Kajian sebelumnya oleh Hery (2007) mengungkapkan bahwa majunya teknologi secara kontinu mampu membuat perekonomian meningkatkan. Karena teknologi yang maju mampu menjadi penunjang kegiatan ekonomi agar tercipta efektivitas dan efisiensi.

Contoh nyata dari kemajuan teknologi dapat dilihat pada kemajuan produk digital yang digunakan untuk transaksi yang dikenal dengan E-money. Implementasi dari penggunaan E-money mampu menciptakan kemudahan dalam aktivitas ekonomi, mengurangi ongkos transaksi, mampu mendorong tingkat konsumsi masyarakat sehingga tercipta perputaran uang yang cepat sehingga mampu meningkatkan pertumbuhan ekonomi (Naomi, 2020).

Disamping itu, dengan adanya E-money dapat meringankan dalam produksi uang tunai sehingga mampu meminimalisir biaya dari pencetakan uang, E-money membantu pemerintah mengurangi tingkat kejahatan pemalsuan uang di masyarakat, dan menciptakan kebijakan digitalisasi pada sistem pembayaran nasional sehingga mampu mendukung pemulihan perekonomian nasional setelah pandemi COVID-19.

HUBUNGAN TINGKAT PENDAPATAN PERKAPITA DENGAN PERTUMBUHAN EKONOMI

Pengertian Simon Kuznet mengenai pertumbuhan ekonomi adalah proses yang sangat panjang dari daerah memiliki kontribusi untuk memproduksi berbagai barang ekonomi untuk memenuhi kebutuhan penduduk. Kuznet memiliki hipotesis tentang hubungan pendapatan perkapita dengan pertumbuhan ekonomi, menurut sudut pandangnya, pendapatan perkapita dapat dijadikan alat ukur tingkat kesejahteraa, jika upah yang diterima seseorang semakin tinggi dapat dikatakan orang tersebut memiliki kesempatan lebih untuk memenuhi kebutuhan hidupnya. Adapun ketika pendapatan perkapita semakin besar maka makin besar dana penerimaan pemerintah daerah, sehingga hal itu mampu memengaruhi pertumbuhan ekonomi nasional.

HUBUNGAN TINGKAT INFLASI DENGAN PERTUMBUHAN EKONOMI

Adapun teori yang dikemukakan oleh Keynes mengenai hubungan inflasi dengan pertumbuhan Ekonomi baik dari jangka panjang maupun jangka pendek. Menurutnya saat jangka panjang, peningkatan inflasi mampu menurunkan pertumbuhan ekonomi. Disaat jangka pendek, apabila terjadi peningkatan harga maka pertumbuhan ekonomi (output) juga ikut meningkat. Dalam jangka panjang, ketika tingkat inflasi sedang meroket maka masyarakat cenderung mengurangi daya beli di pasar ekonomi, keadaan ini akan mengakibatkan penerimaan negara menurun sehingga hal ini dapat

menghambat pertumbuhan ekonomi nasional. Fenomena ini dapat dibuktikan secara empiris dengan penelitian - penelitian sebelumnya mengenai keterkaitan tingkat inflasi dengan pertumbuhan ekonomi, dengan mengungkap fakta bahwa inflasi yang tinggi mampu menurunkan pertumbuhan ekonomi.

METODE PENELITIAN

DATA DAN SUMBER

Kajian ini menggunakan beberapa data meliputi data pertumbuhan ekonomi, tingkat inflasi, pendapat perkapita dan transaksi uang elektronik merupakan data sekunder dari periode 2010 hingga 2022 yang berasal situs resmi Badan Pusat Statistik (BPS) dan Bank Indonesia.

METODE ANALISIS DATA

Uji Asumsi Klasik

1. Uji Normalitas

Pengujian ini berguna untuk menemukan ada tidaknya nilai residual pada model regresi terdistribusi normal atau tidak. Untuk itu kita dapat melihat Jarque-Bera Test untuk mengetahui hasilnya.

2. Uji Autokorelasi

Tujuan dari uji ini ialah untuk mengetahui korelasi/ketertarikan antar-variabel. ketika nilai prob < 0,05 maka disimpulkan terdapat gejala autokelasi, namun apabila nilai prob > 0,05 maka disimpulkan tidak terjadi gejala autokorelasi

3. Uji Heteroskedastisitas

Uji ini bertujuan untuk mengetahui ada tidaknya penyimpangan asumsi Klasik. Apabila nilai prob. nya < 0,05 disimpulkan data penelitian memiliki gejala heteroskedastisitas, sebaliknya jika nilai prob. > 0,05 disimpulkan tidak terjadi gejala heteroskedastisitas dalam data penelitian.

4. Uji Multikolineritas

Tujuan Uji ini digunakan untuk menilai ada atau tidak korelasi yang tinggi antarvariabel independen. Apabila terdapat korelasi yang tinggi antarvariabel bebas dapat disimpulkan penelitian memiliki gejala Multikolineritas

A. Penilaian Goodness of Fit (Uji Hipotesis)

1. Koefisien Determinas

Penggunaan Nilai Adjusted-R2 ditujukan untuk menilai seberapa besar pengaruh variabel bebas terhadap variabel terikat.

2. Uji Statistik

Pengujian Uji Statistik t bertujuan untuk menilai pengaruh masing-masing variabel bebas secara sendiri-sendiru terdapat variabel terikatnya. Adapun syarat uji statistik-t yaitu:

PENGARUH PEMBERIAN POSISI HEAD UP 30 DERAJAT TERHADAP SATURASI OKSIGEN PADA PASIEN STROKE DI IGD RSUD DR. T.C. HILLERS MAUMERE KABUPATEN SIKKA

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ABSTRACT:
Stroke is a loss of brain function due to cessation or reduced blood supply to the brain, causing local or global nerve function disorders that arise suddenly, progressively, and rapidly. Blood flow that is not smooth in stroke patients can result in hemodynamic disturbances including oxygen saturation. One of the independent nursing actions to increase oxygen saturation is by giving a head up position of 30 degrees. The purpose of this study was to determine the effect of giving a 30 degree Head Up position on oxygen saturation in stroke patients. This type of research is quantitative research with a quasi-experimental research method with one group pre-test-post-test design. The number of samples in this study were 15 samples with accidental sampling technique. Data were collected using observation instruments. The results showed that 100% of the 15 respondents experienced a decrease in oxygen saturation, and 100% experienced an increase in oxygen saturation after giving the head up position 30 degrees. This study used the Wilcoxon statistical test which showed that giving the head up position 30 degrees had a significant effect in increasing oxygen saturation in stroke patients (p value = 0.000; = 0.05; and Z count = -3.493). There is an effect of giving a 30 degree head-up position on oxygen saturation in stroke patients in the emergency department of RSUD dr. T.C. Hillers Maumere. Recommendations from the study are aimed at nurses so that they can apply the provision of a 30 degree head up position as one of the independent nursing actions for stroke patients and to hospitals to prepare a 30 degree head up position SOP.

KEYWORDS:
Head Up 30 Degrees, Oxygen Saturation, Stroke.

PENDAHULUAN

Stroke adalah penyebab kematian nomor tiga setelah penyakit jantung dan kanker, selain itu merupakan penyebab kecacatan tertinggi di dunia (Pertami, et al, 2019). Berdasarkan data World Health Organization (WHO, 2018), terdapat 15 juta orang menderita stroke setiap tahun. Sekitar 5 juta penderita meninggal, 5 juta diantaranya menderita stroke, dan 5 juta penderita lainnya mengalami kecacatan. Untuk di Indonesia, kejadian penyakit stroke merupakan penyebab kematian utama hampir di seluruh rumah sakit dengan persentase sekitar 14,5 % (Permatasari, 2020).

Berdasarkan data dari American Hearth association (AHA, 2018), sekitar lebih dari 70 % kasus stroke dengan jenis stroke ischemic. Angka kejadian stroke di dunia masih sangat tinggi yaitu sekitar 795.000 jiwa setiap tahun, dan serangan stroke pertama terjadi pada 610.000 jiwa serta 185.000 jiwa mengalami stroke berulang (Fong, 2016).

Berdasarkan data dari Riset Kesehatan Dasar (Riskesdas, 2018), prevalensi penyakit stroke di Indonesia berdasarkan diagnosis tenaga kesehatan sebesar 7 per mil di tahun 2013 meningkat menjadi 10,9 per mil di tahun 2018. Prevalensi penyakit stroke tertinggi di Kalimantan Timur yaitu 14,7 per mil, Yogyakarta 14,6 per mil dan Sulawesi Utara 14,2 per mil, dan terendah adalah Papua yaitu 4,1 per mil (Kemenkes, 2018). Sedangkan untuk Propinsi Nusa Tenggara Timur (NTT), menduduki urutan ke tiga terendah setelah Maluku Utara yakni 6,1 per mil. Di RSUD dr.T.C.Hillers Maumere data yang diperoleh pada tahun 2020 sebanyak 407 orang (Rekam Medis RSUD dr. T.C.Hillers Maumere, 2020), dan data terbaru yang ada di IGD RSUD dr. T.C. Hillers Maumere terhitung mulai bulan Juli sampai dengan bulan September 2021 sebanyak 26 orang. Stroke termasuk kasus kegawatdaruratan dan membutuhkan pertolongan yang cepat dan tepat, karena jika semakin lama stroke tidak segera ditangani maka tingkat keparahan stroke semakin tinggi dan resiko kecacatan yang akan di dapat makin memburuk karena meluasnya sel neuron yang mati dan daerah infark pada otak semakin meluas bahkan dapat menyebabkan gangguan kesadaran dan kematian (Pertami,et al, 2019).

Oksigen merupakan kebutuhan vital bagi setiap makluk hidup. Agar dapat mengukur berapa banyak persentase oksigen yang terkandung di dalam darah, atau di dalam air yang diminum atau pun oksigen di udara yang dihirup disebut sebagai saturasi oksigen (Pertami, et al, 2019). Saturasi oksigen adalah persentase oksigen yang telah bergabung dengan haemoglobin dalam jumlah yang cukup untuk memenuhi kebutuhan tubuh, pada saat yang sama oksigen dilepas untuk memenuhi kebutuhan jaringan. Gambaran saturasi oksigen diperlukan untuk mengetahui kecukupan oksigen dalam tubuh sehingga dapat membantu dalam penentuan terapi lanjut (Ekacahyaningtyas, et al, 2017).

Penatalaksanaan stroke dapat dibagi menjadi penatalaksanaan medis dan keperawatan. Penatalaksanaan medis terdiri dari penatalaksanaan umum (fase akut dan fase rehabilitasi), pembedahan dan terapi obat-obatan. Pemberian posisi head up 30 derajat merupakan salah satu dari penatalaksanaan keperawatan yang dapat dilakukan pada penanganan awal pasien stroke (Hasan, 2018). Posisi head up 30 derajat adalah posisi untuk menaikan kepala dari tempat tidur dengan sudut sekitar 30 derajat dan posisi tubuh dalam keadaan sejajar (Kusuma, et al, 2019). Posisi telentang dengan disertai head up menunjukan aliran balik dari inferior menuju ke atrium kanan cukup baik, karena resistensi pembuluh darah dan tekanan atrium kanan tidak terlalu tinggi, sehingga volume darah yang masuk (venous return) ke atrium kanan cukup baik dan tekanan pengisian ventrikel kanan (preload) meningkat, yang dapat mengarah ke peningkatan stroke volume dan cardiac output. Posisi head up 30 derajat dapat meningkatkan aliran darah di otak dan memaksimalkan oksigenisasi jaringan serebral (Ekacahyaningtyas, et al, 2017).

Berdasarkan data awal yang didapat oleh penulis melalui hasil observasi selama seminggu di Instalasi Gawat Darurat RSUD dr. T.C. Hillers Maumere, didapatkan bahwa tindakan penanganan untuk pasien stroke yang berobat sudah sesuai protap yang ada, namun untuk pemberian posisi head up masih belum maksimal akibat kondisi tempat tidur dan ketepatan dalam penentuan posisi 30 derajat. Dan hasil observasi terhadap saturasi oksigen pada 6 pasien stroke menunjukan bahwa, adanya

perubahan saturasi oksigen sesudah pemberian posisi head up 30 derajat yang diberikan selama 30 menit.

Dengan melihat pentingnya penanganan yang cepat dan tepat serta resiko yang diakibatkan dalam penanganan pasien dengan stroke untuk dapat mempertahankan saturasi oksigen yang adekuat dan meningkatkan perfusi jaringan, maka penulis tertarik untuk melihat lebih jauh mengenai penanganan pasien stroke dengan pemberian posisi head up 30 derajat dalam penelitian dengan judul "Pengaruh Pemberian Posisi Head Up 30 Derajat Terhadap Saturasi Oksigen Pada Pasien Stroke di IGD RSUD dr.T.C.Hillers Maumere".

METODE

Jenis penelitian ini adalah penelitian quasi eksperimen dengan rancangan rangkaian one group pre test, post test design untuk mendeskripsikan saturasi oksigen pasien stroke sebelum dan sesudah dilakukan intervensi posisi Head Up 30 derajat. Desain penelitian adalah penelitian eksperimen di mana peneliti hanya melakukan intervensi pada satu kelompok tanpa pembanding. Efektifitas perlakuan dinilai dengan cara membandingkan nilai pre test dan nilai post test. Jumlah sampel dalam penelitian ini adalah 15 orang pasien stroke dengan teknik sampling non probability sampling berupa accidental sampling. Kriteria inklusi dalam penelitian ini adalah Pasien stroke (iskemik dan hemoragik) dengan nilai saturasi oksigen < 95%, Pasien yang sudah terdiagnosa stroke oleh dokter, Pasien stroke dengan semua tingkat kesadaran, baik yang GCS 15 dan GCS di bawah 15.

Kriteria eksklusi dalam penelitian ini adalah Pasien stroke dengan penyakit paru dan Pasien stroke dengan anemia (Schutz, 2011).