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AN INTERDISCIPLINARY BIANNUAL JOURNAL

Editorial

Dr. Jyoti Agarwal, HOD Department of MBA

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Message from Chairman

With the Grace of God & blessings of our visionary grandparents Sri Roop Chand Agarwal & our Father Shri Ramji Lal Agarwal, we formed a Trust Sri Roop Chand Ramji Lal Educational Trust (RCRL) with a vision to educate youth from all walks of life. At present RCRL Trust encompasses four colleges GITM, GIPS-392, GIPS-960 & GIHSM offering education in all fields of Engineering (Diploma, B.Tech & M.Tech), Pharmacy (D. Pharma, B. Pharma & M. Pharma), Management (BBA & MBA) Computer Application (BCA) & Accountancy B.Com. & B.Com. (Hons), Fine Arts B.F.A & B.V.A. and Pre-Nursery to Class XII C.B.S.E. Affiliated Schooling at Seth M.R. Jaipuria School, Goel Campus.

All the colleges are equipped with experienced and enthusiastic & extremely supportive Staff, infrastructure, latest gadgets of teaching learning process & best internet connectivity. Our aim is to train the students efficiently & effectively across professional boundaries so that they encourage as leaders & innovators in their chosen professions. At GGI, though students come from different backgrounds they are trained to be complete Professional & Wealth Creators for Self & Country at Large. I welcome you to be part of our journey to acquire knowledge that provides benefits both self & mankind.

"Our aim is to become a vibrant knowledge centre of excellence in teaching"

Generating cutting edge research & innovations and enabling empowerment through social and regional inclusion.

Er. Mahesh Kumar Agarwal (Goel)
Chairman/ Trustee-GGI

Pinnacle des Academia is a biannual multi-disciplinary journal, designed to serve research scholars, academicians and professionals by publishing research papers related to different fields such as Management, Pharmaceutical, and Technological. In this current scenario of technological advancements where both online and offline mode of education is playing a significant role, it provides a platform to the experienced as well as new research scholars where they can present their ideas, thoughts and techniques.

Dr. Jyoti Agarwal
Ph. D, M. B. A, M. Com., B.Ed.
Head of Department
Masters in Business Administration
GGI, Lucknow

"If you have rapturous desire for timeless achievements, then think of us".

Goel Institute of Technology & Management, Lucknow

Approved by Ministry of Education, All India Council for Technical Education (AICTE), New Delhi
Affiliated to Dr. A.P.J. Abdul Kalam Technical University, Lucknow &
Board of Technical Education (BTE), Lucknow

Goel Institute of Technology & Management believes in imparting quality education to its students. The Institute has its quality procedures such as, Learning material development including lab manuals, lecture notes and exposure of students to the information available on Internet.

Salient Features of GITM

- Well qualified, experienced, research oriented and technically sound Faculties from eminent universities and institutes of national repute.
- Recognized as an official nodal center of Virtual Labs-IIT Kanpur (An MHRD Govt. of India Initiative).
- Research and Development on cutting-edge research areas like Artificial Intelligence, Big Data, Robotics, Mechatronics, Internet of Things, Renewable Energy, Wastewater Treatment, Genetic Engineering, Molecular Biology, Operations, HRM etc.
- Students get benefited with e-learning and online certified courses from various agencies like NPTEL, SWAYAM, ICT academy, IITs, NITs, TCS and spoken tutorials.
- Organizing Conferences, Seminars, Workshops, Webinars, Guest lectures and Industrial visits for technical, research and industrial exposure among students.
- Well equipped air-conditioned modern Laboratories and Central Library with large number of Books, Editorials and journals for the best R&D purposes.
- Excellent infrastructure with upgraded Technical tools, Audio-Visuals, Smart Classrooms, Seminar Hall's and Auditorium for quality education.
- Students forum "ANKURAM" provides a platform to forecast talent in the field of cultural, sport or literary events.
- Organizing Annual Fest (NAVAL) with Cultural, Sports, Literary and Technical events to break the monotony of the class.
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- Strong collaborations and signed MoU with International and National reputed Academia, Industry personnel and the potential Employer's to enhance academic excellence and better job offers.
- Regular Meritorious and Rank holders in AKTU Examination.
- Excellent and consistent placement records in private, government and public sectors.

AKTU Code: 360
BTE Code: 2291

B.Tech. | Diploma | M.Tech. | M.B.A.

"If you want to sing the saga of success, then think of us".

Goel Institute of Pharmacy & Sciences, Lucknow

Approved by Ministry of Education, All India Council for Technical Education (AICTE), New Delhi
Pharmacy Council of India (P.C.I.), New Delhi
Affiliated to Dr. A.P.J. Abdul Kalam Technical University, Lucknow &
Board of Technical Education (BTE), Lucknow

Goel Institute of Pharmacy & Sciences, Lucknow is located in the heart of the city and far from hustle and bustle free environment was established in the year 2008 with four - year Bachelors program in Pharmacy (B. Pharm). Institute is affiliated to Dr. A.P.J. Abdul Kalam Technical University, (AKTU), Lucknow & approved by the AICTE, and Pharmacy Council of India (PCI), New Delhi. The institute started the Master Program in Pharmacy (M. Pharm.) in 2012 and Diploma in Pharmacy (D. Pharm) in 2017. The D. Pharm is affiliated to Board of Technical Education, Lucknow.

Batches have passed out with excellent academic records and most of the students are working in various well known pharma industries in Quality control, Production and pharma marketing.

Students of the institute have formed a technical forum "Pharma Pharazers". The aim of the forum is to develop a sense of devotion towards their profession by organizing various blood donation camps, Hospital training, Industrial Visit, Industrial Training and rural visits for awareness of health etc.

An age-old career, pharmacy is continually opening new vistas in the medical field. Globally pharmacists are providing excellent support for patient health management system, new drug development and have become the pillar in health management system. Goel Institute of Pharmacy and Sciences is dedicated to nurture the future pharmacist who can work for the sake of nation through imparting high quality job oriented education and training. We make the rigorous fusion of practical & theoretical knowledge to enhance the education of students with emerging new world.

AKTU Code: 392
BTE Code: 2722

B.Pharm. | D.Pharm. | M.Pharm.

"We grow because we struggle, we learn and overcome"

Goel Institute of Higher Studies Mahavidyalaya, Lucknow

Approved by Ministry of Education, All India Council for Technical Education (AICTE), New Delhi
Affiliated to University of Lucknow, Lucknow

Institute offers a spectrum of professional bachelor degree programs in domains like Management, Computer Application & Commerce. Classes of spoken English, cultural heritage and personality development are also conducted. For overall development of students NSS, games sports and extracurricular activities are regular phenomenon. The Institute provides a healthy atmosphere for education that builds the way for a brilliant career in the highly competitive global market. The Institute has a flexible system always striving towards the betterment of its students. We are committed in leveraging the facilities and the system to the world class standards and our goal is to provide academic and professional resources to prepare its students to function as prominent and responsible members of an international community. NSS has been introduced to inculcate the feelings of nationalism, self discipline, and social service in the students.

AKTU Code: 392
BTE Code: 2722

B.B.A. | B.C.A. | B.Com. | B.Com. (H) | B.F.A. | B.V.A.

"Some Tagline..".

Goel Institute of Pharmaceutical Sciences, Lucknow

Approved by Ministry of Education, All India Council for Technical Education (AICTE), New Delhi
Pharmacy Council of India (P.C.I.), New Delhi
Affiliated to Dr. A.P.J. Abdul Kalam Technical University, Lucknow &
Board of Technical Education (BTE), Lucknow

Goel Institute of Pharmaceutical Sciences was established by the Roop Chand Ramji Lai Education Trust. It is located near the heart of the city and far from hustle and bustle free environment. It has started its first academic session from year 2019 with four year Bachelors program in Pharmacy (B. Pharm) and two years Diploma program in Pharmacy (D. Pharm). Institute is affiliated to the Dr. A.P.J. Abdul Kalam Technical University (AKTU), Lucknow & approved by the AICTE, Pharmacy Council of India (PCI), New Delhi and Board of technical education (BTE), UP. The aim of the forum is to develop a sense of devotion towards their profession by organizing various blood donation camps, rural visits for awareness of health etc.

We are committed to the betterment of the students. We organize regular workshops, seminars, field work and industrial visits. The students are given
individual attention and the laboratory infrastructure is sufficient to cater to the needs of the students. Institute has intellectual, dedicated and highly experienced faculty members for the academic progress of the students. The College is equipped with all the modern instruments and machinery to provide the best practical training to budding pharmacists. It also provides a healthy academic atmosphere to the students to achieve their goals.

AKTU Code: 960
BTE Code: 2119

B.Pharm. | D.Pharm.

Seth M.R. Jaipuria School Goel Campus, Lucknow

Affiliated to Central Board of Secondary Education, New Delhi

A School is a temple of education. It requires different methodologies, teaching aids and correct Environment for teaching-learning process, in addition to class rooms and teachers. Principles and Values that are committed to partnering parents in raising the next generation of leaders.

It is a commitment of management for every parents & their ward who is going to take admission in Seth M.R. Jaipuria School, Goel Campus, Faizabad Road, Lucknow, is the personal Responsibility of all my Principal, Faculty, Staff & Coordinator to give homely & healthy atmosphere and make them learn to face any challenge of the world in a passionate manner.

Jaipuria School in Goel Campus is being built up with the most modern & modular form with keeping vastu in mind, pollution free atmosphere, to satisfy a crucial need in today's world for students to learn, observe, introspect and contemplate. Education in such an ambience is a rewarding experience.

I believe that Nation's Progress when they strive for the best in their Individual and Collective Growth in the Growth of one Nation, World order and mankind.

School Code: 71043
CBSE Affiliation No.: 2132807

Pre Nursery to Class XII

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Alleviation of *N-acetyl-para-aminophenol* Induced Hepatotoxicity by *Holarrhena antidysenterica* in Rat Model

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 ABSTRACT

Aim: The current study was designed to examine the effects and possible mechanisms of *Holarrhena antidysenterica* on Paracetamol (PCM) induced hepatic damage in rats.

Methods: Paracetamol (PCM 2g/kg) was regulated to initiate hepatic harm in Wistar rats at a given doses of 200 & 400 mg/kg of *HAE* and Silymarin (100mg/kg) were utilized as treatment groups for 30 days and liver function was examined by determining the SGPT, SGOT, ALP, TB and hematological investigation for evaluating the effect of *HAE* on hepatic necrosis. The possible mechanisms were investigated by measuring hepatic collagen metabolism and oxidative stress level Histopathological consideration.

Results: The oral administration *HAE* treatment significantly inhibited the loss of b.wt and increase of liver weight induced by PCM. *HAE* also improved the liver function of rats as indicated by decreased serum enzymatic activities of SGPT, SGOT, ALP and TB. It also decreased liver MDA and Changes in XOD and subcellular lysosomal enzyme were greatly elevated in the supernatant fractions of liver from the treated rats. Moreover *HAE* significantly decreased liver hydroxyproline (Hyp) content and histopathological studies indicated that *HAE* alleviated hepatic damage and reduced the formation of fibrous septa. The hematological Parameter normal compared with the control. The standardized extract HPTLC investigation uncovered the presence of some critical phenolic compound.

 Conclusion: This examination demonstrated that *H. antidysenterica* could be taken as a decent common wellspring of the hepatoprotective operator.

Keywords: *Holarrhena antidysenterica,* Hepatoprotective, Hydroxyproline, HPTLC, Paracetamol, XOD.

1. INTRODUCTION

Perceptivity of the liver to impairment by such agents is way beyond any other unit due to its central role in metabolism similarly as its ability to concentrate and biotransform xenobiotics [1]. Liver is that the fundamental detoxifying channel inside the human body. However, continuous exposure to sure chemotherapeutical agents, drugs, environmental toxins [2]. N-acetyl-para-aminophenol (paracetamol) was discovered in 1889. As paracetamol is well face it is ordinarily take advantage of as an over-the-counter (OTC) pain relieving and antipyretic for cerebral pain and minor musculoskeletal torment[3,4]. The hepatotoxic effect of paracetamol is associated with the toxic metabolite N-acetyl-p benzoquinoneimine (NAPB), which forms in the liver. This metabolite is detoxified by endogenous glutathione (GSH).

However, if paracetamol is taken in high doses, it depletes GSH stores and leads to an inability to detoxify NAPB sufficiently, which results in hepatic toxicity [5,6]. A rise in lipid peroxidation in paracetamol toxicity is reportedly associated with a decrease in the antioxidant GSH [7]. This suggests that oxidative stress is an important factor in liver toxicity caused by paracetamol [8].

H. antidysenterica under the family of Apocynaceae it is a typical Indian medicinal plant, commercially well-known as Kurchi, has been traditionally used for the treatment of dysentery, and the reported to possess anthelmintic, appetizing, astringent and antidiarrheal, number of steroidal components [9,10] Chemical studies on *H. antidysenterica L.* were undertaken as far back as 1858 when the alkaloid conessine was first isolated by *Hains* [11] bark of the plant. Later in 1930s a note worthy work was carried out by *Siddiqui et al.*[12]. The seeds and leaves were reported to contain a number of alkaloids having steroidal nucleus, such as alkamines, pyrrolidine bases [13] amino-glucosteroids [14,15] and amino-glum cardenolides [16]. These are pharmacologically significant substances. Hence, the aim of current study is to expound the anti-hepatotoxic effect of the standardized *HAE* which has not been reported up till now in rat model of paracetamol induced hepatotoxicity.

2. Material and methods

2.1 Chemicals

Analytical grade chemicals were used for the experimentation. Silymarin powder (Brand name: Silybon was obtained from Micro Labs Ltd., Lucknow, India. Standard kits for SGOT, SGPT and ALP etc. were obtained from Sigma-Aldrich Ltd., India.

2.2. Extract preparation and calculate % yield

The selected parts (Leaves & Bark) of the plant part were dried, grounded and extracted using soxhlet, ultra-sonic/sonication. The plant was acquired from CSIR – National Botanical Research Institute (Speciesmen No-33428) Lucknow, India. Extraction material was performed by soxhlation process in two steps. Firstly, the powdered plant material was defatted under soxhlet assembly using 250mL of 98% petroleum ether for 6 hours. This is followed by 9 hours of soxhlation by using ethanol (50%) as solvent. Then extract was filtered and concentrated under reduced pressure in a rotary evaporator (Buchi R-200 USA) at 37°C and then freeze-dried in lyophilizer (Labconco, USA) to obtain solid residue (ASE, yield 10.3% w/w). The extract was dissolved in 5% dimethyl sulphoxide (DMSO) for the experiments [17] Varied phytochemical tests were performed on 50% hydro-alcoholic *HLE* (Leaves & bark) to screen the existences of numerous phytochemical factor described by Trease and Evans [18] Harborne [19].

2.3. Free Radical Scavenging Activity

The antioxidant activity of the extract and standard was assessed on the basis of the radical scavenging effect of the stable DPPH (1,1-diphenyl-2-picryl-hydrazyl) free radical [20]. The control solution used is 2 ml of ethanol with 2ml of DPPH solution (0.005%). The optical density was recorded and percent of inhibition was calculated using the formula given below [21].

% of inhibition of DPPH activity = (A–B/A) × 100

Where, A is optical density of the control and B is optical density of the sample.

2.4. Experimental provision and treatment timetable (Biological activity)

2.4.1 Ethics statement

All experiments were performed in the morning accordance with the protocol for the experiments on animals were approved by CPCSEA, New Delhi (approval number: 1732/GO/R/S/13/CPCSEA).

2.4.2. Choice of animals

Male Wistar rats weighing about 120–160 g were used, from the animal house of the National Laboratory Animal Centre, They were kept under controlled conditions of temperature 27 ± 2^0C and relative humidity 44-56%, light/dark cycles of 12 hours respectively for one week before and during the experiments, and the food was withdrawn 18-24 h before the experiment though water was allowed ad libitum.

2.4.3. Acute oral toxicity

The acute oral toxicity study was carried out as per the guidelines set by Organization for Economic Cooperation and Development (OECD) received from Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA). One-fifth of the median lethal dose (LD_{50}) was taken as an effective dose (Kale et al., 2012)[22]. Six mice fasted for 24 hours but allowed free access to water. A limit dose of 2000 mg/kg administered sequentially and animals were observed individually for behavioural profile (alertness, restlessness, irritability, and fearfulness), autonomic profiles (defecation and urination), neurologic profile (spontaneous activity, reactivity, touch response, pain response, and gait), physical states such as lacrimation, loss of appetite, tremors, hair erection, salivation, diarrhoea, and for morbidity or mortality, after dosing continuously for 2 hours, periodically during the first 24 hours (with special attention given during the first 4 hours) and daily thereafter, for a period of 14 days.

2.4.4. Schedule on PCM prompted hepatotoxicity [23]

Animals were divided into 5 groups containing six animals each:

Group I: Control group (2% w/v acacia suspension),

Group II: Positive control (PCM as a toxic drug 2g/kg, p.o on 5th day)   Route: Oral

Group III: Standard (STD) (100 mg/kg Silymarin, p.o) + TD (Toxic drug)

Group IV: HAE $_1$ 200 mg/kg, + TD

Group V: HAE $_2$ 400 mg/kg, + TD   Duration: 30 days

At the end of experimental period, blood samples of the fasted rats were collected from the retro-orbital plexus immediately with capillary tubes (Micro Hematocrit Capillaries, Mucaps) under ether anesthesia. Then, the blood was centrifuged at 3000 r/min for 15 minutes and serum was collected for different Quantitative analysis of enzyme activities (SGPT) Serum glutamate pyruvate Transaminase, (SGOT) Serum glutamic oxaloacetic transaminase, Alkaline phosphatase (ALP) , Total protein (TP) and Total bilirubin (TB). Gella FJ. et al. [24] Rosalki SB. et al.[[25]

2.4.5. Monitoring the hematological profile

The hematological analysis carried out for RBC, WBC, platelet (Pt) and differential leukocyte count, haemoglobin (Hb) by using an automated hematology analyzer. (Humacount: Human, Weisbaden, Germany).

2.4.6. Specimen preparation

Hepatic tissues of rats were homogenized (10%) in phosphate buffer (pH 7.4) with a Potter- (Ultra-Turrax T25, made in Germany) homogenizer. The homogenate was centrifuged at 12,000 rpm for 20 min at 4 °C to obtain post mitochondrial supernatant (PMS) and it was used for the estimation of Lipid peroxidation (LPO) Catalase (CAT), Superoxide dismutase (SOD), Malondialdehyde (MDA) Xanthine oxidase (XOD) and lysosomal enzyme (Cathepsin D , β-Galactosidase) estimated a method of Buege J et al. [25] Aebi H et al.[26] Kakkar P et al. [27] Upadhyay SN et al. [28], Utley H.G et al. [29], Stirpe F et al. [30] respectively and of liver was measured and after that hepatic flaps were utilized for the histopathology areas

2.4.7 Determination of Hydroxyproline (Hyp) contents

Hyp was determined by the calorimetrically in duplicates form 0.2gm of liver tissue using a modified method of Jamall *et al* 1981 [31].

2.4.8. Histopathological investigation

The tissues were mounted by embedding in paraffin wax in the laboratory and sections of the size of 6 mm were cut. The sections were stained with eosin and haemotoxylin dyes. The slides were observed under light microscope and photomicrographs were captured by using camera. These were observed for fibrosis, fatty infiltration, and centrilobular necrosis and lymphocyte infiltration [32].

2.4.9. Biostatical interpretation

Each data were represented as the standard error of the mean (S.E.M.) of the different experiments under the same condition. For multiple comparisons, one way analysis of variance (ANOVA) was used to make a statistical comparison between the groups followed by Newman–Keuls multiple comparison tests. The results with $p<0.05$ were considered statistically significant.

3. RESULTS

3.1. Preliminary phytochemical, DPPH free radical and HPTLC analysis of *HAE*

Preparatory phytochemical scrutiny of *HAE* demonstrated the nearness of flavonoids, glycoside, amino acid, steroids, phenolic, polysterols and saponins. The DPPH (1,1-diphenyl-2-picryl-hydrazyl) assay indisputably delineated that IC_{50} value for Ascorbic acid and *HAE* was individually 2.37±0.06 & 175±1.41μg/ml which demonstrates the significant antioxidant activity of *HAE*. HPTLC investigation of *HAE* insist the event of flavonoids, the significant constituents was found as glycoside and the acquired quantitative information by utilizing HPTLC the presence of Gallic acid (Rf:0.31) and Quercetin (Rf:0.44) which are useful in the hepatoprotection .
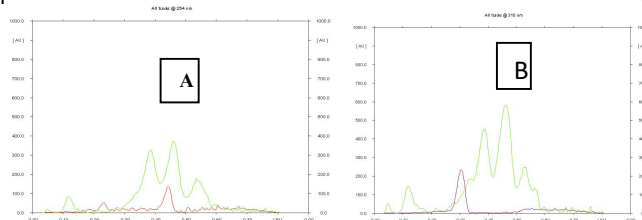
Fig. 1(A, B) HPTLC analysis of *HAE* with standard Quercetin (A) Gallic acid (B).

3.2. Acute toxicity study

The *HAE* in Wistar rats did not create any mortality when directed orally at dose of 2000 mg/kg. If mortality occurred in two out of three animals at any dose, then this dose was assigned as toxic dose. If the mortality occurred in one animal, then this same dose was repeated to confirm the toxic dose. If mortality did not occur, the procedure was repeated for further higher dose, i.e., 2000 mg/kg. One-twentieth and one-tenth of the maximum tolerated dose of the extract tested (2000mg/kg) for acute toxicity, did not indicate mortality was selected for evaluation of hepatopreventive effect of *HAE* i.e., 200 and 400 mg/kg.
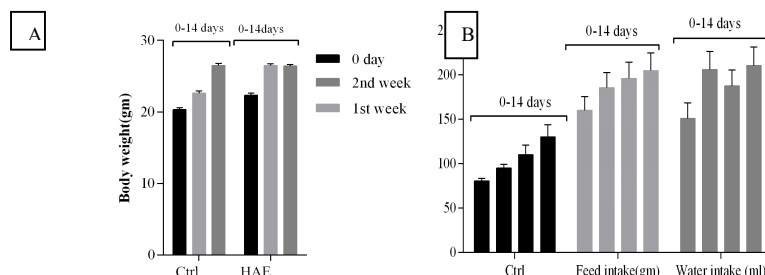
Fig no 2(A): There was no toxicologically significant difference in body weights between control and *HAE* treatment groups.

3.3. Hematological parameter

Parameter	WBC(103/uL)	RBC(106/uL)	Hb (g/dL)	HCT(%)	MCV(fL)	MCH(pq)	MCHC(g/dL)	PLT(103/uL)
Ctrl	14.39±1.95	7.54±0.24	13.38±0.64	40.74±1.48	54.06±0.83	17.74±0.39	32.8±0.57	801±76.52
Treatment	14.39±1.95	7.54±0.24	13.38±0.64	40.74±1.48	54.06±0.83	17.74±0.39	32.8±0.57	801±76.52

Table no.1 There were no toxicologically effects observed in any of the hematological parameters represents significant $p<0.01$** when compared with control. The platelet count was increased in treatment group as compared to the control group.(Ctrl: control; Hb, hemoglobin; HCT, hematocrit; RBC, red blood cells; WBC, white blood cells; PLT, platelets; MCV, mean corpuscular volume; MCHC, mean corpuscular hemoglobin concentration; MCH, mean corpuscular hemoglobin.

3.4. Effects on *HAE* in PCM induced hepatotoxicity in Wistar rats

(a) In Liver weight/100g b.w
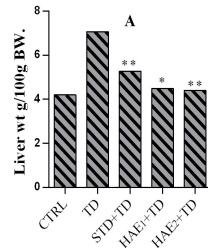
Fig no.3(A) Administration of TD (PCM) at a dose of 2g kg^{-1} b wt. p.o. significantly increase and reverse the liver weight represents significant at p<0.05* highly significant at p<0.01** when compared with control group I. Data are means ± SEM (n=6 for CTRL, TD, STD, HAE$_1$, HAE$_2$). CTRL: Control, TD: Toxic drug (PCM 2g/kg); HAE$_1$: 200 mg/kg, HAE$_2$: 400 mg/kg, STD: Standard: (Silymarin100mg/kg).

3.5(a) Quantitative analysis of enzyme activities

The results of biochemical markers on PCM (2g/kg) intoxicated rats are shown in (Fig no.4 A, B, C, D, E, and F) significantly (P < 0.05*) elevated SGPT, SGOT, ALP, TB compared to control group I. Treatment of *HAE* at a dose of 200 & 400 mg/kg, administration significantly reversed the elevation of SGPT, SGOT, ALP activities towards normal. Total Bilirubin significantly reduced (P<0.05*) by administration of *HAE* at a dose of 200 & 400 mg/kg as compared to hepatotoxic (PCM) group II. The protection was better on dose 400 mg/kg and a significant increase (P<0.01**) was observed in the biochemical parameter against the hepatotoxic toxic group II. Administration of Silymarin significantly reversed (P<0.01**) the altered liver markers levels when compared to hepatotoxic group II.
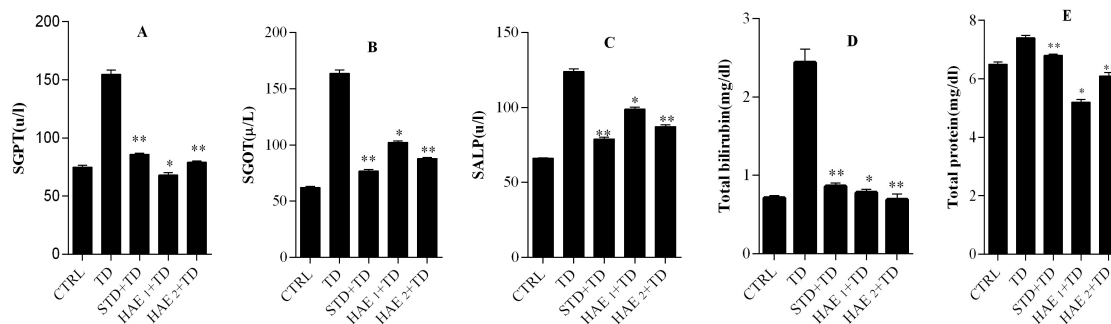
Fig no.4 (A,B,C,D,E) The effects of *HAE* in Biochemical markers (SGPT, SGOT, Alkaline phosphate, Total bilirubin(TB), Total protein (TP),in PCM induced hepatotoxicity represents significant at p<0.05* represents highly significant at p<0.01** when compared with control. Data are means ± SEM (n=6 for CTRL, TD, STD, HAE$_1$, HAE$_2$). CTRL: Control, TD: Toxic drug (PCM2g/kg), HAE$_1$:200mg/kg, HAE$_2$:400mg/kg, STD: Standard: (Silymarin100mg/kg).

3.6 Changes in XOD (Xanthine oxidase) and subcellular distribution patterns of liver Cathepsin D and β-Galactosidase of Wistar rats.
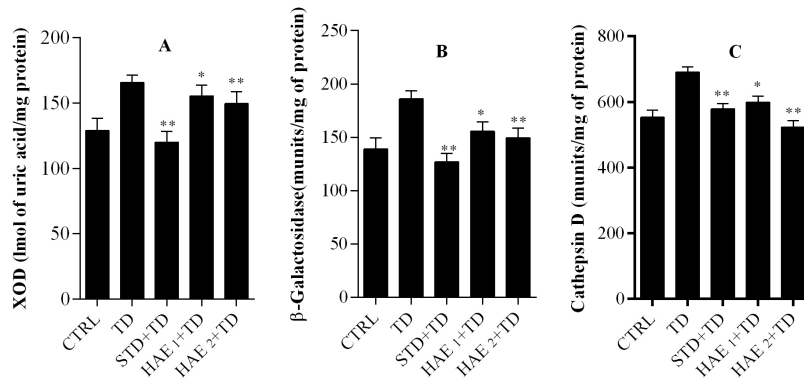
Fig no 8 (A, B, C) Effect of *HAE* on liver homogenates in PCM induced hepatotoxicity in Wistar rats represents significant at (p<0.05**)** represents highly significant at (p<0.01****) when compared with control. Data are means ± SEM (n=6 for CTRL, TD, STD, HAE₁, HAE₂). CTRL: Control, TD: Toxic drug (PCM 2g/kg); HAE₁: 200 mg/kg, HAE₂: 400 mg/kg, STD: Standard: (Silymarin100mg/kg).

3.7 Effect of *HAE* on Hydroxyproline (Hyp) content and Histopathologic grading of liver necrosis in experimental rats.

Collagen content of liver tissue were quantified by determination of Hyp content (shown fig no).The Hyp content were significantly increase (P<0.05*) in PCM treated group with compared with respective control group I. The entire treated group significantly reduced (P<0.01**) liver Hyp content.
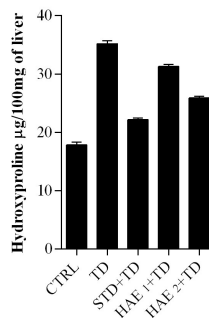
Fig no 8(A) Hydroxyproline (Hyp) content and Histopathology grading of liver necrosis and Wistar rats represents significant at p<0.05* represents highly significant at p<0.01** when compared with control. Data are means ± SEM (n=6 for CTRL, TD, STD, HAE₁, HAE₂). CTRL: Control, TD: Toxic drug (PCM 2g/kg); HAE₁: 200 mg/kg, HAE₂: 400 mg/kg, STD: Standard: (Silymarin100mg/kg).

3.8. Histopathological observations

Microscopic examination on normal control rats, there were no appreciable changes in liver histology. (Fig no. 9A) TD (PCM 2g/kg) the degeneration and necrosis of liver cells, presence of pycnotic nuclei, granular cytoplasm and increase in intercellular spaces with inflammatory collections and loss of cellular boundaries (fig no. 9B) STD (Silymarin) demonstrated normal structure of hepatic lobules, radish dark spots are glycogen, and white spots demonstrate vacuoles, and prominent blood vein. (Fig no.9C) *HAE₁* (200mg/kg) indicated recuperation of hepatic parenchyma, mellow congestion and miniaturized scale vesicular changes. (Fig no. 9D) *HAE₂* (400 mg/kg) indicated stamped recuperation in hepatic cells with nuclei, cytoplasm, focal vein and portral traid. Histological examination of liver tissues in rats supplemented with *HAE₂* at the dose

of 400 mg/kg b.wt showing nearly normal tissue architecture, absence of inflammatory cells in the central areas showing significant Hepatoprotective effect.
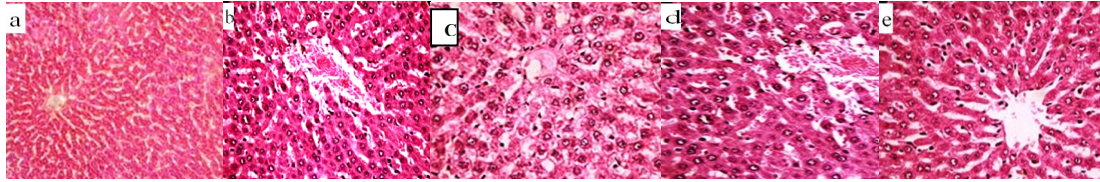
Fig no. 9(A,B,C,D,E)   Effect of *HAE* against Paracetamol induced Histopathological changes in experimental groups of rats (H&E staining 40X). (A) Normal rats, (B) Liver section of TD (PCM 2g/kg) induced rat liver toxicity (C) Liver section of Silymarin treated rats, (D and E) Liver section of rats treated with *HAE* 200 & 400 mg/kg.

4. Discussion

4.1. Hepatocellular injury and retrograde changes

The overabundance dosages of the pain relieving and antipyretic acetaminophen speak to a stand out amongst the most widely recognized pharmaceutical item poisonings in the United States today [33]. Although considered safe at restorative measurements, in overdose; acetaminophen creates a centrilobular hepatic necrosis that can be lethal [34]. The examination was finished to evaluate antioxidant and hepatoprotective impact of *HAE* and the preparatory phytochemical compound, for instance, alkaloids, flavonoids, tannins, phenolics, saponins, terpenoids and other fragrant compound are discretionary metabolites that are made in plant.

The investigation decisively delineated that IC_{50} estimation of DPPH measure for Ascorbic acid and *HLE* was individually. The DPPH assay indisputably delineated that IC_{50} value of for Ascorbic acid and *HAE* was individually 2.37±0.06 µg/ml &175±1.41µg/ml which demonstrates the significant antioxidant activity of plant extract.

4.2. Effect of acute toxicity studies

There was no toxicologically significant difference in b.wt between control and treatment group Food and water intake showed daily fluctuations within the range of control animals.With the acute toxicity test at the limit test dose of 2000 mg/kg, neither mortality nor changes related to behavioural, autonomic, neurologic, and physical profiles were observed within the first 24 hours and during the 14-day follow-up. General conduct and b.wt are among the fundamental parameters for the assessment of the essential indications of poisonous quality [35].

4.3 Effect of Hematological parameters in intoxicated rats

Assessment of hematologic parameters will be used to verify the extent of deleterious effect of foreign compounds including plant extract on the blood constituents of an animal. Such toxicity testing is relevant to risk analysis as changes in the hematological system have higher predictive value for human toxicity, when data are translated from animal studies [36]. It can also be used to justify blood relating functions of plant extract [37]. The present study has revealed that there was no vital difference in Hb, red blood cell, white blood cell, and MCV in the *HLE* treated groups compared with control group I.

4.4. Biomarkers of liver appraisals

Damage to the structural integrity of the liver is reflected by an increase in the levels of serum transaminase [38] because these are cytoplasmic in location and are released into the circulation after cellular damage and increase in the level of γ-GT also indicate the severe liver damage induced by paracetamol. γ-GT is a membrane bound enzyme, that is virtually absent in non-hepatic tissues [39]. Silymarin has liver regenerative effects by stimulating the enzyme known as RNA polymerase in the nucleus of liver cells. This results in an increase of ribosomal protein synthesis which helps to regenerate hepatocytes [40]. Compared with normal control, PCM administration significantly elevated serum levels of ALT, AST, ALP and TB, TP ($p < 0.01**$) (show fig no.4 A-D) which were significantly decreased by *HAE* 200 & 400 mg/kg treatment in a dose-dependent manner.

4.5. In liver homogenate Profile

Various intracellular compounds such as catalase, superoxide dismutase, and glutathione peroxidase provide protection against oxidation [40]. Malondialdehyde (MDA), a breakdown product, is a measure of lipid hydroperoxides, causing lipid peroxidation. In the present study, there was a significant ($p<0.05*$) increase in the level of MDA and a significant ($p<0.01**$) decrease in oxidative stress parameter and levels in the *HAE* groups (200-400 mg/kg) when compared to the respective control group I, which are signs of oxidative stress due to excessive formation of free radicals in the experimental animals. [41,42]

XOD is a Mo–Fe–S flavin containing hydroxylase, and is accounted for to contribute in different types of damage [43]. These chemicals create ROS in catalyzing the response, and thusly, an expansion in its action prompts the oxidative anxiety [44]. The significantly raised action of β-Galactosidase, Cathepsin-D (munits/mg of protein) are resolved and the more likely sources of the elevated activities of cathepsin-D and β-galactosidase in the liver supernatant fraction of rats treated with the hepatotoxin. The secretion of proteinases and other hydrolases from phagocytic cells is important, because the lyric process of necrotic liver tissues has been suggested to occur extracellularly [45].

4.6 Effect of hepatic collagen contents (Hyp)

Collagen is the major structural protein of cellular matrix of the liver. Hydroxyproline, a degradation product of collagen, can be excreted from body in urine. Hyp content in liver was significantly increased after PCM administration for 4 weeks, and this effect of PCM was inhibited by *HAE* dose dependently ($p < 0.01**$). Moreover *HAE* treatment promoted collagen degradation, as suggested by increased Hyp level in urine.

4.7 Changes in liver histology

In livers of PCM-treated rats, there were macronodules separated by fibrous septa, as well as steatosis, inflammation, hepatocyte ballooning, and necrosis as indicated by HE staining (Fig no 9B) and widespread alterations of normal liver architecture, and increases in connective tissue septa (Fig.no.9C). *HAE* treatment ameliorated the severity of liver damage and reduced the formation of fibrous septa (Fig.no.9 D, E) induced by PCM.

5. Conclusion

The hydroalcoholic *HAE* has shown dose dependent activity against Paracetamol induced hepatic damage in experimental rats. Data analyzed indicate that development of extreme levels of oxidative stress in the liver determines opposite cellular responses, depending on the period of exposure to ROS.

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgement

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A SOPHISTICATED STUDY ON BIOLOGICAL ACTIVITY OF QUINOLINE MOIETY

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INTRODUCTION

Heterocyclic compound have contain versatile function in drug discovery and development. Most commonly used hetero atoms N,O based heterocyclic compound, like pyrrol, indole, pyridine, imidazole ,quinolone, morpholine, furan,pyran etc.

Quinoline is also known as 1-aza-naphthalene or benzo [B] pyridine is nitrogen containing hetrocyclic aromatic compound,its molecular formula is C_9H_7N and its molecular weight is 129.16. Quinoline nucleus occurs in several natural compounds(cinchona alkaloids)and quinoline derivatives are exceptionally known for their broad spectrum of activity including Anti-malarial , Anti-Bacterial ,Anti-fungal, Anthelmintic, Cardiotonic, Anticonvulsant, Anti-inflammatory, Antiprotozoal activity and Analgesic activity etc [1].

Quinoline moiety is one of the most N based potent bioactive compound because they have various type of medicinal and synthetic used in organic chemistry as well as in industrial chemistry. There are number of natural product of quinolone skeleton used as a medicine or employed as lead molecules for the development of newer potent molecules(2).

Quinoline was first extracted from coal tar in 1834 by Friedlieb and Ferdinand Runge.Coal tar remains the principle sources of commercial quinoline(2)

Quinoline is a weak tertiary base and can form salts with acids.It shows similar reaction to pyridine and benzene and can also participate in both electrophilic and neucleophilic substitution reaction(3).

BIOLOGICAL ACTIVITIES AND APPLICATIONS

1.ANTIDEPRESSANT ACTIVITY

Antidepressant containing active compounds 2-substituted 4-phenylquinolines were synthesized and reported by Alhaider.A et al 1984 . The synthesized quinoline derivative shows excellent antidepressant activity .The 4-phenylquinoline nucleus play significant role on antagonizing [4]
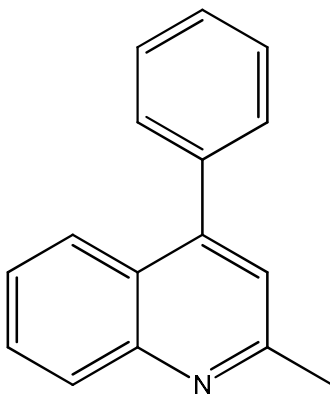
2-substituted-4-phenylquinoline

2.ANTI-INFLAMMATORY ACTIVITY

Aboutab. et al 2021 synthesized and reported 7-chloro-4-(piperazin-1-yl) quinoline derivative shows potent anti-inflammatory activity .inflammation is a primary defense mechanism of immune system ,which is

triggered by tissue injury ,infection ,allery and toxic of harmful stimuli and start the healing process in body[5] .
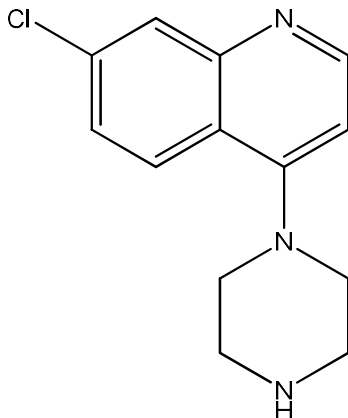
7-chloro-4-(piperazin-1-yl) quinoline

3.ANTIPROTOZOAL ACTIVITY

J. McNulty and co-workers synthesized and reported 4-Arylquinoline-2-carboxylate(f derivatives exhibit potent antiprotozoal activity against the pathogenic parasite Toxoplasma gondii [6], Fournet and co-worker synthesized and reported 2-substituted quinoline alkaloids as extracted from G. longiflora plant .it is used in the treatment of new world cutaneous leishmaniasis have a antileishmanial activity [7],Fakhfakh and co-workers synthesized and reported Alkenyl and akylnyl quinolines shows potent activity against cutaneous leishmaniasis ,African trypanosomiasis ,Chagas disease , and Visceral leishmaniasis[8] , Franck and co-workers synthrsised and developed quinoline derivatives which showed activity against Trypanosoma cruzi [9].
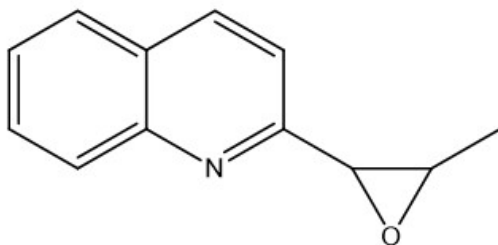
2-(3-methyloxiran-2-yl)quinoline
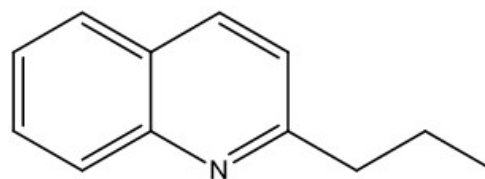
2-propylquinoline

4.ANTI MICROBIAL ACTIVITY

Antimicrobial Agents (AMAs) are the greates contribution of 20th century to therapeutics .drugs in this class differ from all others in that they are designed to inhibit /kill the infecting organism and to have no/minimal effect on the recipient . Antimicrobial Agents are drugs used to kill/ inhibit microbial infection, caused by micro-organism (Bacteria ,fungi,viruses & other micro-organism).Antimicrobial Agents are broad class of drugs it includes Antiseptics ,Antibiotics ,Antibacterial,   Antiviral   ,Antifungal   ,Antiprotozoal ,Antihelmintics.

Some side effect arises due to uses of AMAs – 1.Toxicity (a)local irritancy,(b) Systemic toxicity , 2. Hypersenstivity reactions 3.Drugs resistance (i) Natural resistance(ii) Acquired resistance , Mutation (i)Single step ,(ii) Multistep,Gene transfer ,4.Superinfection 5.Nutritional deficiencies ,6.Masking of an infection.[10].

The rising multi-drugs resistant microbial infections in the last few decades has become a serious health care problems . The search for new antimicrobial agents will consequently always remains as an important and challenging task for medicinal chemists[11].

Singh,S.P; & Co-workers synthesised and reported 1-aryl /hetroaryl-5 methyl -1-2,4-triazolo[4,3-a]quinoline derivatives synthesized and tested in vitro for their anti bacterial activity and the compound 28 shows good antibacterial activity [12].
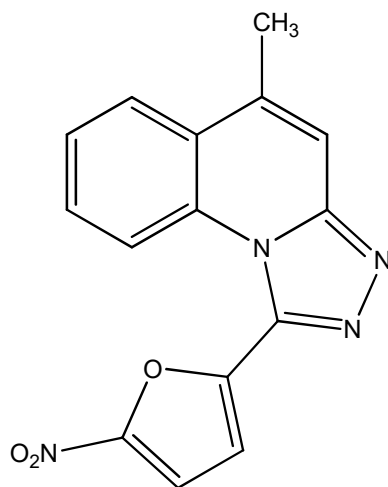
5-methyl-1-(5-nitrofuran-2-yl)-[1,2,4]triazolo[4,3-*a*]quinoline

Compound-28

5) Functionally active quinoline

Functionally lively Quinolines by-product: Tanbakouchian Zahra et. al 2019, they advocate that four numerous form of functionally energetic Quinolines by-product must be produced via exceptional forms of isocynides react with 2 chloroquinoline three carbonitriles underneath appropriate reaction condition. Inside the presence of palladium catalyst, aliphatic and aromatic isocyanide react with 2-Chloroquinoline-three-carbonitriles to supply 2 alkyl (aryl)-1-imino-IH pyrrolo 13,four-b] quinolin-3(2H). Tert- butyl isocyanide after reaction produce 3- cyanoquinoline 2 carboxamide.Isocyanoacetate inside the presence of C2CO3 to generate imidazo[1.5-a]quinoline derivatives. Tosyl methyl isocyanide react with 2 chloroquinoline-3 carbonitriles under appropriate response circumstance to produced 2-tosyl-3-cyanoquinolines.

3-cyanoquinoline 2-carboxamide

(15)
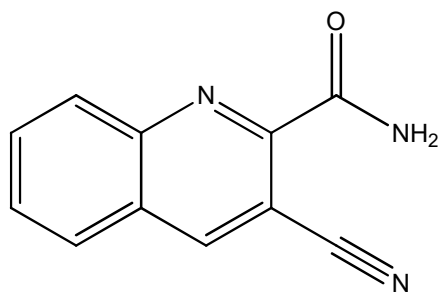
6) Antitumor agents

Zhu jiongchang et. al 2019 synthesized a series of novel quinolines bearing an 7-position alkoxy group and a 4-aniline substituent at the 4-position of the quinoline ring. Compounds N-(3-Fluorophenyl)-7-(octyloxy)quinoline-4-amine,7-(benzyloxy)-N-(3-nitrophenyl)quinoline-4-amine,7-((4-fluorobenzyl)oxy)N-(3-nitrophenyl)quinoline amine and ((7-(3-phenylpropoxy)quinoline-4) It was found that - yl)amino)phenyl nitrate has broad-spectrum antiproliferative activity. These compounds had IC50 values of less than 10 mM against seven human tumor cell lines. Among these compounds, potential antiproliferative agents against HCT-116, RKO, A2780 and Hela cell lines with IC50 values of N-(3-methoxyphenyl)-7-(3-phenylpropoxy)quinolin-4-amine compound produced the most 2.56, 3, 67, 3.46 and 2.71 mM. N-(3-Methoxyphenyl)-7-(3-phenylpropoxy)quinoline-4amine compound inhibited tumor growth and reduced tumor weight in animal models (mouse). The mode of action this compound inhibits the growth of colorectal cancer through the ATGS-dependent autophathy pathway. As a result, it was found that this quinoline derivative has the potential to be developed as a new antitumor drug .
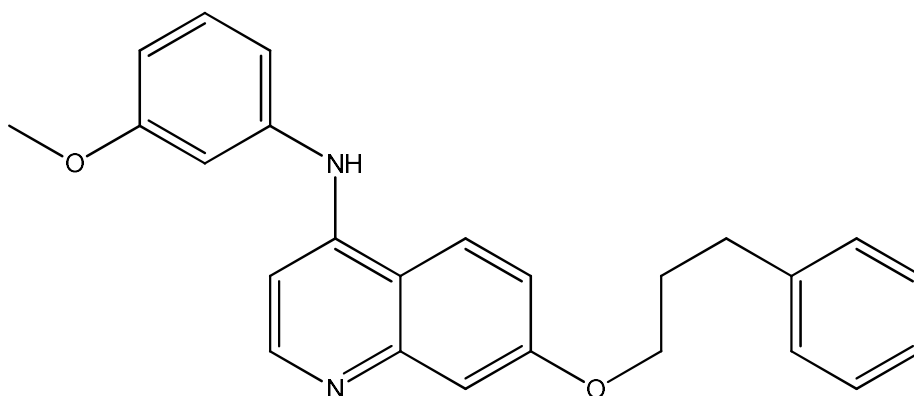
N-(3-methoxyphenyl)-7-(3-phenylpropoxy)quinolin-4-amine

Fu Hai-Gen et al 2019 synthesized nineteen new quinoline derivatives via the Mannich reaction. Evaluation of their antibacterial activities against gram-positive (G) and gram-negative (G-) bacteria.7 compound (4-((5-chloro-8-hydroxyquinolin-7-yl)methylpiperazin-1-yl-1-cyclopropyl-6-fluoro-4-oxo-1,4-dihydro-18-naphthyridin-3-carboxylic acid) exerted potent activity against G and G strains with MIC values of 0.125-8 µg/ml. Through molecular docking studies, this compound could target both bacterial LpA and Top IV proteins, thereby exhibiting broad-spectrum antibacterial activity.

7) Anti-bacterial activity

The antibacterial activity of Liu Hua Zhi et al 2018, the production of new quinoline derivatives, styryl substituent on the orthoposition of 1-methylquinolinium, and their in vitro antibacterial activities were thoroughly investigated. As a result, quinoline derivatives show intrinsic antibacterial activity against tested pathogens including drug-resistant strains of MRSA, VRE and NDM-1E.coli2-((E)-4-fluorostyryl)1-methyl-4-((E)-(3-Methylbenzo[d]thiazol(3H)ylidene) methyl) quinolin-1-ium iodide shows excellent antibacterial activity, and methicillin and vancomycin are higher than its MICS in drug-resistant strains. Quinolinium derivatives can inhibit the GTPase activity and dynamic assembly of FtsZ, thereby delaying bacterial cell division and bacterial cell death. Further evaluation of these compounds for the development of new targeted antibacterial agentsz c indrug-resistant strains. Quinolinium derivatives can inhibit the GTPase activity and

dynamic assembly of FtsZ, thereby delaying bacterial cell division and bacterial cell death. Further evaluation of these compounds for the development of new targeted antibacterial agents.
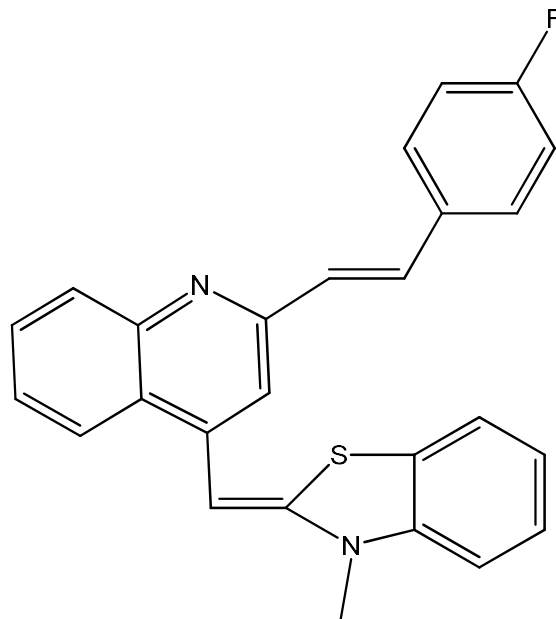
(*Z*)-2-((2-((*E*)-4-fluorostyryl)quinolin-4-yl)methylene)-3-methyl-
2,3-dihydrobenzo[*d*]thiazole

(8) Dermatophyte

Anti-dermatophytic Machado Monte Rosa By using Skaraup & Doebner-von Miller, Gabriella da et al. (2010) made a variety of substituted 2-methyl-4-ph quinoline derivatives. The aniline and an unsaturated ketone are combined to perform the reaction. The phenyl substituent at position C-4 on 4-phenylquinoline is what causes it to act as an anti-dermatophytic. It was discovered that the anti-Candida properties of 2-methyl quinoline and 2-methyl 4-c quinoline. According to G.D.R.M. Machado, quinoline derivatives like 2 meth phenyl quinoline are strong candidates for novel effective and cost-saving medications for dermatophytosis due to their possible toxicological profiles.
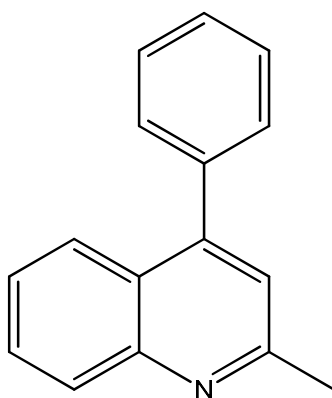
2-methyl-4-phenyl quinoline

Hypoglycaemic activity

Quinoline carboxyguanides prepared by Edmont et al. 2000 are hypoglycaemic agents.

R= H,(NH)NH2
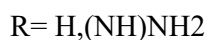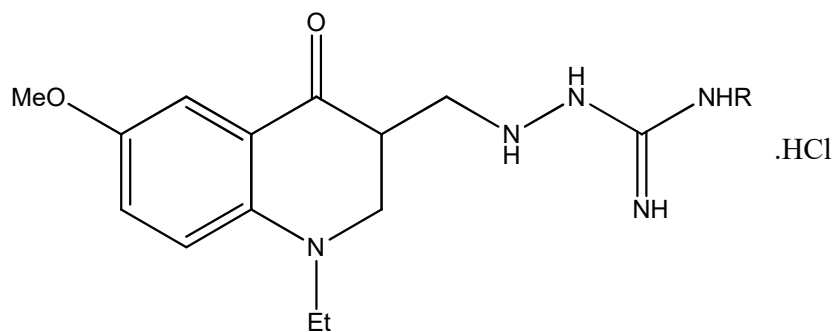
Reproductive System

Certain tetrahydroquinolines developed by Wallace et al. 2003 are selective oestrogen receptor modulators.

R=H,3-OH,4-OH; X=CH$_2$, O
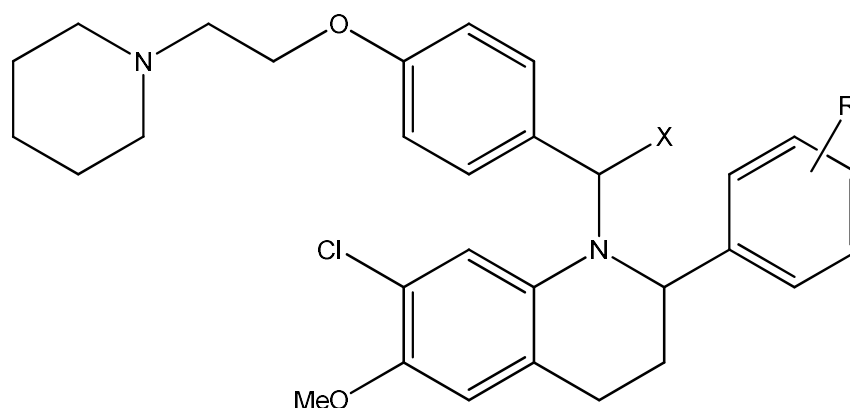
[1]Akranth Marella ,Om Prakash Tanwar,Rikta Saha , Mohammad Rahmat Ali , Sandeep Srivastav ,Mymoona Akhter ,Mohammad Shaquiquzzaman Mohammad Mumtaz Alam, A Versatile hetrocyclic : Quinoline ,Department of Pharmaceutical Chemistry ,Faculty of Pharmacy ,Jamia Hamdard (Hamdard university), New Delhi 110 062, India.

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An Inclusive Study on Image Caption Generation
by means of Deep Neural Networks

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Abstract.

Caption Generation from an Image is a task that involes Object Detection and Natural Language Processing. Research in the Object Detection has been progressing tremendously since a decade. Traditional approach of Object Detection includes three steps: (1) region selection (2) Feature Extraction and (3) Classification. But in recent research, Neural Networks are used to overcome the hand-crafted feature extraction along with the application of classification techniques through various algorithm such as SVM, AdaBoost and Deformable Part Model (DPM). To generate a Caption we can take the help of Neural Network specifically Recurrent Neural Network (RNN). In most of the Caption Generator a variation of RNN that is Long Short-Term Memory (LSTM) is used. Many researchers adopts either sampling or Beam Search to generate a valid sentence/caption. In this paper we have discussed the fundamental idea behind the presently available Image Caption Generator and compare their architectural design with their performance.

Keywords: DNNs, Convolutions, LSTM, Auto-Encoder, Fine-Tunning, Attentions Mechanism.

Introduction

Image Description or Caption generation is the fundamental problem in Artificial Intelligence, which deals with the object recognition along with Natural Language Processing(NLP). This task gained the attention of computer vision research communities because of its direct relation and applications with society. For example, smart cites can have instant alarm system when any incident / unpleasant scene captured in the security cameras, or a blind person can get descriptive command when he/she face any obstacle in his/her way, Driver alertness detection[14]. As we have stated that Image Caption generation consist of two different domains of research, so in this paper we have investigated some research articles to find the common approaches they have used and finally summed off with an abstract idea of fundamental architectural design and working principle of presently available Image Caption Gener- ator.However, before we jump into the in-depth details of any Image Caption Generator, we need to understand the image and its properties because in this research direction image is the principal ingredient. Now a days, the image that we may encounter in our daily life, are mostly captured through digital camaras. These images are digital Images which can be stored in the memory of a digital computer. That will lead to a new era of subject domain called as Computer Vision. The digital images are presented as a composition of pixels in the computer memory. Here the pixel is the smallest unit of a digital image that presents the intensity of a signal value. The signal that we have received from the digital camera are analog in nature and they must be converted into a numerical value. In other words, there exists a signal- to-symbol converter, which is responsible for the above said conversion of signal intensity to the corresponding pixel value. These pixel values of a digital image can be stored in a two-dimensional array. However, the objects in the real world are in the form of 3-Dimention rather than 2-Dimention. It is customary to say that these 3- Dimensional objects are mapped into the 2- Dimensional Image. It is worth noting that, Computer vision is inverse optics or inverse graphics, which can be represented by using some techniques like shading and shadows, gradients and many more. In case of binary image or monochromatic image, each pixel may be represented as either 0 (Black) or 1 (White). However, if the Image is not the binary image, then the intensity of each pixel may be presented through a cell of the matrix and that range from 0 to 255(8bits). In other words, the colour images are represented using three colour planes each of which are 8-bit, i.e., total 24-bit per pixel. Nevertheless, there exists some medical images that are Grey-scale images, which makes the utilization of 2D matrix with higher pixel intensities (16 bits) to represent the image and these usually ranges from 0 to 65535. On the other hand, the colour images are presented through the Three-Dimensional Tensor to represent three intensity level of each pixel of the image. These colour images are presented

through various colour model to present colour channels such as Lightness-A-B(LAB), Red-Green-Blue (RGB),HueSaturation-Value (HSV). It is worth noting that, some images can be presented through floating point or rational numbers. If we discuss the properties of a digital image, then resolution may came into the picture. Where resolution is the unit measure of the number of pixels in an unit area of the image. Similarly, spatial resolution represented by the form of density of element determined by number of independent pixels in an image. Whereas luminance resolution determined by number of bits per pixel resolved by digitizer. The image property can be compressible, manipulable as per requirement of the format like, .jpeg / .jpg , .mpeg , .gif , .tiff etc. To understand an image completely we need to concentrate not only over the image classification but also on object localization. The object localization is a subtask of object detection where we need to employ some object classification techniques. Since our image captioning task involves both the techniques from object detection and natural language processing, we need an encoder-decoder architecture by employing some Deep Neural Networks [24, 25, 15, 19, 18, 17] as caption generator. Further the remaining contents of this paper is organized as follows: The Section-2 contains the Literature Review, the Section-3 describes the general architecture of any Caption Generation Model. The sub-section 3.1 and 3.2 explains the fundamental idea about Neural Network and Attention Mechanism respectively. The Section- 4 describes the Object Detection part and Section-5 is introducing the Caption Generation part. Finally, the Section-6 is presenting the list of Dataset generally used in caption generation model along with their benchmark metrics followed by the conclusion.

Literature Review

There exist an URL, http://www.arxiv-sanity.com/ which presents the list of recently published article in arXiv Repository. Most of these articles are from the field of Machine Learning, Computer Vision, Artificial Neural Network and Natural Language processing. So, from this webpage we got the Idea of potentiality of research in the domain of Computer Vision. The Object Detection and Image Classification are the two principal field of research in Computer Vision. Then we decided to review the available literature in this field. During our review we got two papers, which are as follows:

•   A Comprehensive Survey of Deep Learning for Image Captioning by Hossain et al. published on ACM Computer Survey, 2019.

•   A Systematic Literature Review on Image Captioning by Staniute et al. published on Applied Science, MDPI Journal, 2019.[22]

From these two journal Papers, we came to know that the very first work "A Multimodal Neural Language Models" on Image Caption generation was done by Kiros et al. in 2014 at International Conference on Machine Learning held at Beijing, China. This was the only one conference paper on this field in 2014. Later on, in the year 2015, only four papers are published, and most of them are highly cited article. Afterwards the research on the field of Image Caption Generation was captured with flying colors, and we may see in the academic year 2017-18, 57 Research paper has been published and the graph of popularity of these papers exponentially growing.(For further reference see Figure-1)

Basic Architecture of Image Captioning

The Image Caption Generation system is originally inspired from the Machine Translation.[26][17] When
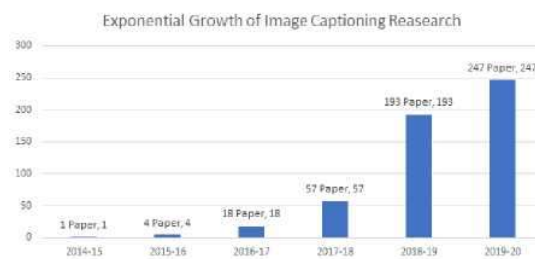
Sl.No.	Authors	Contents
1	Karpathy et. al.	proposed an alignment model which is combination of CNN and Bidirectinal RNN alongwith a structured objectives.
2	He et. al.	presented a residual learning framework to ease the training of network.
3	Soh et. al.	proposed an generative CNN-LSTM model that beats human performance.
4	Mikolov et. al.	introduced the skip-gram model.
5	vinyals et. al.	proposed the generative model based on a deep recurrent architecture that combines computer vision and machine learning to generate sentences.
6	Zhang et. al.	presented a layer flexible RNN that applies the attention mechanism.
7	Krizhevsky et. al.	trained a deep CNN by implementing dropout, which will reduce overfitting.
8	Lindh et. al.	address the limitations of generic caption and trained the image retrival model by unsupervised learning, which is capable of generating more divergent and specific caption.
9	Baker et. al.	proposed metaQNN, which is a meta-modeling algorithm based on reinforcement learning.
10	Prelec et. al.	proposed an algorithm "suprisingly popular algorithm", that claim knowledge extraction from crowd.
11	Karras et. al.	proved the GAN can be implemented using Actor-Critic Model, which will improve qality, stability and variation of image manipulation.

Table 1: The List of research papers Reviewed
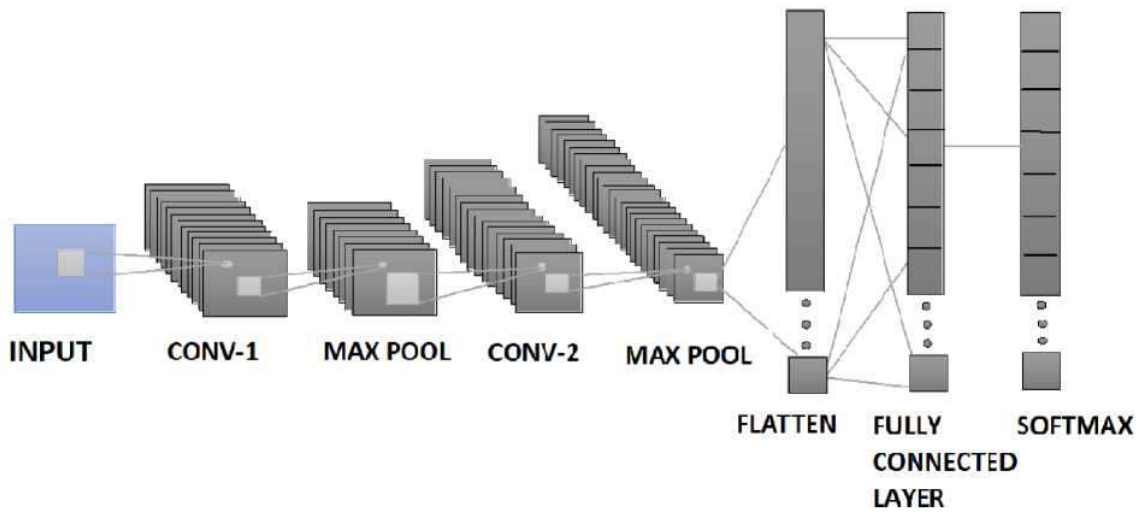
Figure 1: Graph to show exponencial growth of research in the domain of Image Caption Generation

Machine Translation gained its polpularity, where two RNNs are used in the form of Encoder-Decoder architecture. Here the Encoder RNN usually receives a set of words(Sentence) as input and the decoder RNN evaluates the desired sentence. This idea of Machine Translation inspired the advances of Image Caption Generation by replacing the encoder RNN with a Deep Convolutional Neural Network(CNN). It has been observed in last few years that many researchers used CNN as encoder, because it can extract the features from the input image and capable of embedding these features to a fixed length vector. However, the Fundamental idea behind any image captioning system comprises of Object Recognition along with Caption Generation. The Convolutional Network/Convolutional Neural Network was first proposed by LeCun *et al.(1989)* and it was initially designed to process the data, which are in a grid-like structure(e.g Matrix). The CNN performs a convolution operation over kernel and Input data(Matrix). (Refer Figure-2) Mathematically, the discrete convolution operation may be stated as:

$$S(t) = (x * w)(t) \qquad (1)$$

where w is a *probability density function.*

These Convolutions are of *3* different types:

1. Naive Convolution

2. Dilated Convolution

3. Transposed Convolution

In most of the encoder-decoder architecture, the transposed convolutions are implemented. Similarlly, The Recurrent Neural Network has the cycles in the network. In 1986 *Hopfield and Tank* proposed a Neural Network, which was called as Hopfield Network, Later on, David RumelHart modified the Hopfield Net and proposed a new network called as Reccurent Neural Network in 1986. Now a days, most of the encoderdecoder architecture are based on *LSTM (Long Short Term Memory)*, which is a variation of RNN proposed by *Hochreiter and Schmidhuber*[8] in 1997. Here the object recognition are most often carried out by the the pattern recognition, in this paper we have highlighted some of the basic methods to classify an object, that is much more crucial to study in terms of computer vision. The pattern recognition may also be carried out using many techniques such as graph matching, neural networks, genetic algorithm, simulated annealing, and fuzzy logic. However it is important to note that object recognition will not be possible without using knowledge. in artificial Intelligence the knowledge are presented to a computer system using logic. these logic are two types Predicate Logic and Propositional Logic. the production rules may be framed using either of these two logic. Now a days, most of the image captioning system are based on Neural Networks. For example, AlexNet, VGGNet, ResNet, GoogleNet, DenseNet are often used as feature extractor that are purely based on some Neural Network. It is evident that, in most of the image recognition system, an encoder and a decoder are used to represent an image in computer memory. According to the Andrej's thesis [10] there exists two strategies of image encoding, and these are:

· Global Image Encoding.

· Fragment Level Image Encoding.

In Global Image Encoding, the Convolutional Neural Network (CNN) is used to encode a raw image into the vector. Here the CNN is used as a Feature extractor function, that is $CNN_{g_c}(I)$, where I is the image pixel and 9_c is the number of parameters passed. Mathematically the encoding can be represented as:

$$V = W \ [CNN_{ec}(I)] + b \qquad\qquad (2)$$

where the b is the bias and W is the weight and V is

the output vector.

On the other hand, In Fragment Level Image Encoding, the Region-based CNN (R-CNN) is used to encode the image in to a set of vectors V_r and mathematically we can represent the feature extractor function as:

$$V_r = W \ [CNN_{\alpha c}(I)] + b \qquad\qquad (3)$$

where the b is the bias and W is the weight and V_i is

the set of output vectors

Analogous to the image encoding, the sentence/ caption may be encoded by encoder, where each word may be encoded with the one-hot encoding technique [10]. The Recurrent Neural Network (RNN) is used as a decoder in the encoder-decoder model *(figure-1)* and since it has the general problem of gradient vanishing, LSTM (Long Short-Term Memory) [8] can substitute RNN. Since LSTM posses long memory structure, it overcomes the problem of gradient vanishing problem [27].

The Neural Network
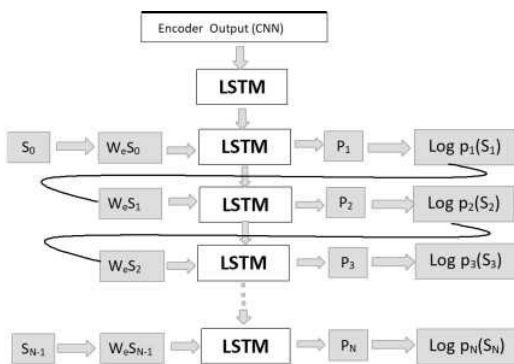
Figure 3: The Caption Generation of LSTM

According to the pioneer work of *McCulloch and Pitts(1943)*, the Neural Network is the composition ability of self-selection. In the neural network model, the attention mechanism allow the neural network to focus on its sub inputs to find the specific feature of an image. we may categorise these attention mechanism in following categories:

Soft Attention Soft Attention is generally applied on machine translation, which focuses on calculating the weighted sum of entire-region of an image. A deterministic model can be formed by calculating weighted attention vector.

Hard Attention Rather than focusing on the entire region, Hard Attention focuses on a partilular location. this location may be selected randomly based on either by random sampling or by maximum sampling.

(23)

of neurons / (McCulloch-Pitts) neurons. Therefore, The Deep Neural Networks(DNNs) are the architectural models where many (Hidden)layers of these interconnected neurons are composed to form a more complex networks.The Neural Networks gained its popularity since 1980, when most of the Neural Networks are used for Pattern Recognition. all neural networks may be categorised in two different classes such as Feed Forward Neural Network and Back Propagated Neural Network. The Neural Network having multiple hidden layers may be termed as Deep Neural Network[13] and the famous DNNs includes Convolutional Neural Network, Recurrent Neural Network etc. however these nueral networks requires a large amount of training Data set for the improvement of its performance. The Dataset such as Flicker, MSCOCO[12], ImageNet may be used to train the Deep Neural Network such as DeepCNN. The concept of the neural network is popular and efficient in image captioning until big data and deep learning is introduced. Image description generation method based on encoder-decoder model. An encoder is the CNN. The last layer that is the convolutional layer extracts the feature of an image. A decoder is the RNN, that is used for image description generation. RNN has more importance in the era of deep learning. LSTM is the special RNN architecture that able to solve the problem of gradient disappearance and has long-term memory. Inspite of this encoder-decoder architecture of Image Captioning system, Now a days, a new mechanism grabbing the attention of the researchers and that is Attention Mechanism.

The Attention Mechanism

The attention Mechanism has a complex cognitive ability, stemming from the human brain. Attention is the focuses on a particular location of input Image.

Scaled Dot-Product Attention This attention function can be presented by a key, value, and query value. It is faster and more space-efficient than multi-head attention, if it becomes a scaled-down attention function.

Global Attention Global Attention evaluates the weight distribution of the model by comparing current hidden layer of decoder with each hidden layer of encoder.

Local Attention It is the combination of soft and hard attention. As compared to other attention techniques, it reduces the cost of attention mechanism.

Adaptive attention Adaptive attention is applicable to extract spatial data and provides Visual Sentinel.

Semantic attention It selects the semantic value and include them into the hidden state along with the output of the LSTM.

Spatial and channel wise attention It selects the semantic attributes to derive the necessity of the sentence context.

Areas of attention It represents the state of dependencies between predicted words, image region, and the state of the language model(RNN).

Deliberate Attention Deliberate Attention observes the habits of peoples and generates image caption accordingly.

The Object Detection

In earlier days, a virtual premitive recognizer was used to generate caption for videos[2]. these systems are based on rule-based system where an And-Or graph is used along with handcrafted features. Similarly, Object Detection can also be applied over the images where the traditional process of object detection involves three basic steps, which includes: (1)region selection, (2)feature extraction and (3)object classification. A multi scale sliding window is used to select the region where the objects are located. This process of selecting the region is also called as object localization. Now at this stage, to recognize an object in a particular image, one need to extract the visual features. These visual features of an image may be categorized in two different class according to their usage. The features such as SURF, SIFT, ORB are categorized as Point-like features, where as the features such as LBP, HOG, Haar may be categorized as Face-like features. More clearly the former are the features that are used for the algorithm where the point like information are required. For Example, a fingerprint matching algorithm need this kind of feature. On the other hand, the features like LBP,HOG and Haar are used for Face Recognition. However, the features descriptor may generates a large variations in feature extraction due to objects view point, occlusions, poses, and light condition. The final step is the object classification, where the classifiers are used to classify an object from another object present in an image. The popular classifier includes the name of SVM, AdaBoost etc. However since this traditional approch posses two drawbacks such as : (1) redundancy in bounding box generation, (2) the involvement of handcrafted feature. there was a scope of advancement in this area of research, therefore when Deep Learning becomes polpu- lar in 2006, many Deep Neural Networks are used in this field to recognize an object. Furthermore, the Object Detection may be categorised in two different categories: (1) Generic Object Detction and (2) Salient Object Detection.

Generic Object Detection:

It intends to locate and classify the object present in one of the images, with rectangular rounded bounding box labeling to show the existence in a confidence manner. The arrangement of Generic object detection is defined as two types:
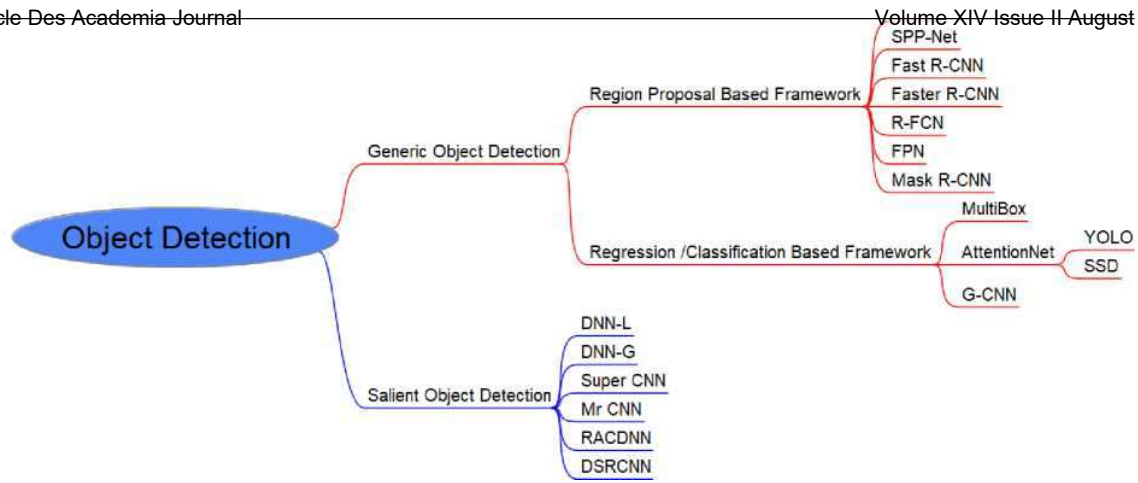
Figure 4: Different Categories of Object Detction

1. Region Proposal Based Framework
2. Regression/Classification Based Framework

Region Proposal Based Framework

It consists of two-steps which is equivalent to the attention mechanism within a certain range. At first it scans the whole image by focusing on the interested region. It applies CNN in sliding window method to predict the bounding boxes directly from the location. The region proposal based methods includes the models such as: SPP-net, R-CNN, Fast R-CNN, Faster R-CNN, Mask R-CNN, R-FCN, and FPN.

R-CNN: In 2014 Ross Girshick has proposed R- CNN[3]. It applies the selective search that generates 2000 region proposals for each image.R-CNN improves the feature extraction and the quality of the anchor box (Bounding Box).

SPP-Net:SPP-Net was proposed by He *et.al.* and it is based on the theory of "Spatial Pyramid Maching" . SPP-Net reuses the feature mas at 5th convolution Layer and presets as fixed length feature map.

Fast R-CNN:Fast R-CNN is identical to SPP-Net in terms of architecture. Here the extracted feature map are processed through a sequence of fully connected layer and finally it produces two separate output layer. Faster R-CNN: Faster R-CNN was proposed by Ren *et. al.* and as per his proposal a Region Proposal Network will be used. This Region Proposal Network will be responsible for producing object boundaries. More clearly, an Image is fed into an Region Propasal Network , which will produce a set of rectangular proposal. R-FCN:R-FCN was proposed by Li *et. al.* which is the acronym of Region-based Fully Convolutional Network. It produces m^2 number of score maps with a fixed grid size of m x m. Note that, the score map used here is a position sensitive score map. Here, for each Region-Of-Interest(ROI) a m^2 score map can be produced.

FPN:FPN is the acronym of Feature Pyramid Network, which is based on bottom-up approch. In FPN, feature pyramid can be built by down sampling the feature map with stride of two. Since the feature pyramid can retrive simantics from all levels of convolution layer, it is independent from the architecture of Convolutional Neural Network.

Mask R-CNN: Mask R-CNN can detects an object and perform instance segmentation for each instance of object. actually these are the two separate task, which requires parallel processing. Therefore Mask R-CNN adds an extra level to predict segmented mask in pixel to pixel mode. Note that Mask R-CNN is flexible enough for instance recognition along with other task such as "human pose estimation" with little modification.

Regression / Classification based Framework

These Frameworks are on-step framework and these are based on pixel to anchor box mapping strategy along with class probabilities. In this section we will present two significant framework known as (1) You Only Look Once (YOLO), (2) Single Shot multibox Detector (SSD).

YOLO: YOLO was proposed by Redmon *et. al.* that can predict anchor box along with their confidence factor. YOLO can also maps a probability map for each class (Class Probability Map). YOLO comprises of twenty four number of convolutional layer followed by two fully connected layer.

SSD: SSD was proposed by Liu *et.al.* and SSD was inspired by multiple anchor box adoption. The SSD appends predition from feature

maps to bounding box in order to handle objects with different size. in the architecture og SSD, we can observe that multiple feature layers are added to th VGG-Net16 taht are responsible to predict the offset of the anchor box with their confidence factor.SSD always trained with a weighted sum of localization Loss and Confidence Loss.

Composition of Captions

Several researches have been carried out since last few years in the field of object annotation, and Natural Language Processing, for example, according to the S. Li *et al.* n-gram language model along with Maximum Likelihood Estimation (MLE) can be used to predict the next possible words from the corpus of possible words, and merged together to form a caption / sentence. Similarly, a research paper of G. Kulkarni and his colleague proposed "Babytalk: understanding and generating simple image description", which states that Hidden Markov Model(HMM) along with the Conditional Random Field (CRF) can be used for Image Description generation. Part of Speech Tagging and Bag of words are also the two mostly explored field in this direction of research. Patrov et. al[16] twelve POS classes are defined, that are also called as Universal

POS tags, and are as follows:

1. Noun (nouns)
2. Verb (verbs)
3. ADJ (adjectives)
4. ADV (adverbs)
5. PRON (Pronouns)
6. Det (Determinates)
7. ADP (Prepositions and Postpositions)
8. NUM (numerals)
9. CONJ (conjunctions)
10. PRT (particles)
11. ?.? (punctuation mark)
12. X (Others)

Similarly, according to the Andrej karpathy [10] a word embedding matrix may be used for encoding a caption from an one-hot vector I, and mathematically the sentence may be presented as $S_t = W_w I_t$, where W_w is the matrix of parameters to learn during backpropagation[11]. in most of the caption generator model Beam search is used to find a probable sentense/ caption. in [26] it was presented as:

$$9 = \arg\max_g \quad \log p(S|I; 9) \quad (4)$$

$$_{(I,S)}$$

where 9 is the parameter, I is the input Image and S

is the partially completed Sentence. Then a joint prob-

ability over many partially completed sentence will be

applied as:

$$\log p(S|I) = \sum^{N} \log p(S_t|I, S_0, S_1, , S_{(t-1)})_{(t=0)}$$

$$(5)$$

Datasets and Results

Since Image captioning is a multimodal task of image classification and natural language processing, it always grabs the attention of the Computer Vision Researchers and in last decade plenty of research studies have been devoted in this field. For example, according to the research paper of Moses Soh [21], there exists two different approach on image captioning and these are top-down approach and bottom-up approach. The architecture we have discussed in previous section fall on the category of former one. In our previous paper(Tripathy et.al), we have used the PBOD[4] and GDX-ray dataset for scanned x-ray images.the accuracy of our proposed model can be observed in the figure-5 given below of this section. Google Neural Image Caption (NIC) Generator has illustrated the benchmark of BLUE-4 by 27.7 which is better than human baseline performance(Refer Table-2). In this context it is worth noting that, there exist many other evaluation models / Benchmarks such as: METEOR[9], ROUGE[20], CIDEr[7], SPICE[27]. In his paper he has implemented a generative CNN-LSTM model and made experiments over the MSCOCO dataset [12]. To alleviate overfitting attention mechanism may be used with a pre-trained mask R-CNN model in conjunction with beam search[1]. According to the Marc Tanti et. al.[23] RNN could be used as an encoder

in caption generation and this can be achieved by bottom-up approach [12]. He explained that, image features can be injected into the RNN and merged together to form the caption. Similarly, Thomas Mikolov *et al.* proposed a skip-gram model, which is a learning method of learning the vector of words from an unstructured corpus of words. Later on, the word2vec[6] (word to vector) software was developed by the same author on the basis of skip-gram model. There exist many other datasets which includes ImageNet[11], PASCAL VOC[3] and SUN over which benchmarks are established earlier. Most of these datasets are labelled through crowd workers.
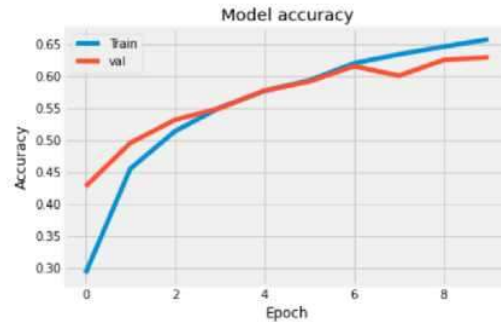
Figure 5: Accuracy of our model for Threat Detection

Name	Train	Valid	Test
Cifar	60,000	50,000	10,000
MSCOCO	82,783	40,504	40,775
PASCALVOC	2,501	2,510	4,952
Flicker8k	6,000	1,000	1,000
Flicker30k	28,000	1,000	1,000
SUN	76,128	21,750	10,875
IMAGENET	1,281,167	50,000	1,00,000

Table 2: List of Datasets and Number of Images.

Conclusion

In this paper we have compared various architecture of object detection mechanism and also reviewed the caption generation methods such as, PoS tagging, beam search etc. The sole part of any of the Image caption generator is comprises of these two parts. However, some DNNs such as GooLeNet beats the human level performance in object detection, In our review we found that if the Tabu Search[5] applied over the Beam Search(size=1) for caption generation then the model can perform better.

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SOCIAL MEDIA MESSAGE APPROACH: A CONTENT SCRUTINY OF FUNDED POSTS AND ENDORSED TWEETS

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ABSTRACT

This paper examines the frequency and effectiveness of message strategies on Facebook and Twitter. Utilizing a content analysis of sponsored messages taken from Facebook and Twitter news feeds of undergraduate student subjects, the research analyzes message objectives and tactics, product categories, and consumer engagement. Results show significant differences in the effectiveness of message tactics overall and between the two social media sites. The findings suggest that some tactics that generate high numbers of likes and shares, like cause- related posts, may be underutilized, while others, like the straight sell, are very common and less effective.

INTRODUCTION

Social media advertising spending approached US\$ 90 billion in 2019 and is projected to reach US\$ 125 billion by 2023 (Statista, 2019). Although Facebook dominates social media advertising, Twitter, with global revenue over 3 billion (Statista, 2020), is also a significant player. Research on brands' use of social media is increasing rapidly, providing greater insight into both strategies and effectiveness. However, this research has primarily utilized brands' posts on their own pages, not brands' paid messaging. Brands' posts to their own accounts may or may not be "boosted" through payment to appear in consumer news feeds. Furthermore, most studies have looked at either two to three very broad categorizations of message strategy or at vary narrow tactical features. Therefore, the purpose of this study is to examine both broad advertising objectives and specific advertising tactics used in sponsored posts as they occur in users' news feeds.

LITERATURE REVIEW

Message strategy for marketing communications can be defined as "a guiding approach to a company or institution's promotional communication efforts for its products, services, or itself" (Taylor, 1999). However, from early studies on print and television advertising, to more recent studies on social media, message strategy has been operationalized in many ways, and at many different levels of generality. In early and influential work in this area, Puto & Wells (1984) devised a four category typology of message strategy based upon informational and transformational dimensions. According to Puto & Wells (1984, p. 639), informational advertising "provides consumers with factual.. .relevant brand data," while transformational advertising "associates the experience of using (consuming) the advertised brand with a unique set of psychological characteristics." In recognition of the unique nature of social media— specifically, the ability of users to respond to brands' social media messages—studies examining social media message strategy have often added a behavioral dimension to message strategy, usually referred to as "interactive" (de Vries et al., 2012; Cvijikj & Michahelles, 2013; Tafesse & Wein, 2018). Tafesse & Wein (2018) define the interactional message strategy as one that, "cultivates ongoing customer interactions through the rich interactive affordances of social media" (p. 244). These three categorizations

or types of message strategies neatly mirror the three components of attitude: cognitive, affective, and behavioral (Rosenberg & Hovland, 1960; Breckler, 1984). There are theoretical models to support the ability to influence attitudes through each of these three components. Attitudes can be influenced by changing beliefs about an object or action (e.g., Fishbein & Ajzen, 1975); by associating affect with an object or action such as by classical conditioning (Gorn, 1982; Stuart et al., 1987); or by inducing action consistent with the desired attitude to produce cognitive dissonance (Cummings & Venkatesun, 1976; Wicklund & Brehm, 1976).

        In efforts to more completely describe message strategy, in particular when predicting effectiveness, many researchers have included more specific marketing communication methods or tactics. For example, Laskey et al. (1995), drawing on Puto & Wells, defined nine subcategories: comparative, unique selling proposition, preemptive, hyperbole, generic, other informational, user image, brand image, and use occasion. Similarly, O'Guinn et al. (2009) define message strategy to include both broader objectives and more specific methods. In social media research, categorizations of message strategy have also ranged from broad to more specific. Tafesse & Wein (2018) categorized Facebook posts according to the informational, transformational, and interactive strategies discussed above; Tafesse & Wein (2017) devised a twelve-category framework for categorizing brands' social media posts; and others have coded very specific tactics such as links, videos, and hashtags (Cvijikj & Michahelles, 2013; Swani et al., 2014).

        Our understanding of the relationship between message strategy and effectiveness is complicated, not only by the differing conceptualizations of message strategy, but also because of a number of moderating factors, including product category and medium. Laskey et al. (1995) found that the preemptive strategy was effective in generating brand preference in the breakfast foods and snacks category while the unique selling proposition strategy was effective in generating brand preference in the household items category. Likewise, Kim et al. (2015) found differential effects of task-oriented, interaction-oriented, and self-oriented strategies for convenience versus service brands. Several social media strategy studies have found transformational strategies and tactics to increase "likes" on Facebook (Ashley & Tuten, 2015; Tafesse & Wein, 2018; Yuki, 2015), while Taecharungroj (2017) found that action-inducing content increased retweets on Twitter, and Araujo et al. (2015) found informational cues increased retweets. In addition, studies have identified differential effects on effectiveness measures including likes, shares, and comments (Cvijikj & Michahelles, 2013; de Vries et al., 2012; Tafesse, 2015). A summary of social media studies utilizing content analysis to study message strategy effectiveness is shown in Table 1.

Table 1			
Social Media Message Effectiveness Studies			
Authors	**Sample**	**Message Strategies**	**Significant Findings**
Araujo etal. (2015)	Tweets from 298 profiles from 65 top 100 global brands	Informational and emotional cues	Informational cues were predictors of higher levels of retweeting.
Cvijikj & Michahelles (2013)	Facebook posts from 100 FMCG (fast moving consumer goods) brands	Vividness, interactivity, entertainment, information, remuneration and interactivity	Entertainment increased likes, comments, and shares. Brand-related information increased likes and comments. Interactivity had a negative effect on likes and comments. Remuneration increased comments.
deVriesetal. (2012)	Facebook posts from 11 international brands from six different product categories	Vividness, interactivity, information, and entertainment	Vivid and interactive post characteristics increased likes. Interactive post characteristics increase comments.
Kimetal. (2015)	Facebook posts from 92 global brands	Task-oriented, interaction-oriented, and self-oriented	Task-oriented generated the most likes, comments, and shares. For convenience brands, self-oriented received more likes that interaction-oriented. For service brands, interaction-oriented generated more likes than selforiented.
Swani et al. (2013)	Facebook posts from 193 Fortune 500 companies	Corporate branding, emotional content, and calls to purchase	The use of corporate brand names lowered the number of likes and the use of emotional content increased the number of likes. Emotional content generated relatively more likes in service accounts than in product accounts. The use of corporate brand names generated relatively more likes for B2B than B2C accounts.
Taecharungroj (2016)	Tweets from Starbucks	Information-sharing, emotion-evoking, and actioninducing	Action-inducing increased tweets and favourites. Visual content increased effectiveness.
Tafesse (2015)	Facebook posts from five top selling automotive brands in the UK	Vividness, interactivity, novelty, brand consistency, and content type (informational, entertaining, transactional)	Vividness increased brand shares. Interactivity had a significant negative effect on likes and shares. Novelty and consistency increased likes and shares. Entertaining posts generated more likes than informational posts.
Tafesse & Wein (2018)	Facebook posts from 20 top global brands	Informational, transformational, and interactional	Transformational posts generated a higher level of engagement (likes + shares).

Drawing from the above research, the current study examines message strategy on two levels in order to investigate both the nature of sponsored messages and their effectiveness. The first, broader, level divides messages into three categories that reflect the message objective: information, transformation, and action. These categories have substantial theoretical and empirical support behind them (Breckler, 1984; Puto & Wells, 1984; Rosenberg & Hovland, 1960) and are closely aligned with typologies that have been

used both with Facebook (Tafesse & Wein, 2018) and Twitter (Taecharungroj, 2017). In addition to the three broad message objectives, in order to provide greater specificity and consistency with prior research (Laskey et al., 1995; O'Guinn et al., 2008), the study also looks at five additional, narrower, tactics: promotion, cause/institutional, curiosity, image, and straight sell.

HYPOTHESES

The literature suggests both theoretical and empirical support for the belief that message strategy impacts message effectiveness (Ashley & Tuten, 2015; Tafesse & Wein, 2018; Yuki, 2015) and that both its usage and its impact on effectiveness differ according to product category (Kim et al., 2015; Laskey et al., 1995). Therefore, we propose:

H1: Message effectiveness will vary significantly with respect to message strategy.

H2: The (a) frequency and (b) effectiveness of message strategies will vary significantly by product category.

The literature review did not uncover previous studies that directly compared the effectiveness of different message strategies on Facebook and Twitter; however, studies looking separately at each of these sites have shown conflicting results with respect to the most effective strategy, e.g., transformational for Facebook (Tafesse & Wein, 2018) and action-oriented for Twitter (Taecharungroj, 2017). Given this finding, and the knowledge that message outcomes are affected by medium and media vehicle (Arens et al., 2013), we also propose:

H3: The effectiveness of message strategies will vary significantly by social media site (Facebook versus Twitter).

METHODOLOGY

Sixty-three traditional undergraduate student subjects from three upper-level business courses at a US university participated in the study. Subjects were given written instructions and then verbally led through the process of visiting the desktop and mobile versions of four different social media platforms, logging in where applicable, and capturing screenshots from each. The screenshots were taken simultaneously, during each class time. The first two collections took place on the same day, and the second on the following day, so all sponsored messages were collected within a 24-hour time span. Only the desktop data collected for Facebook and Twitter are utilized in the present study. Google Chrome Full Page Screen Capture was used in order to capture the entire page and not just the viewable screen. The resulting files were saved on the students' laptops and then transferred to flash drives provided by the instructor.

Eliminating screenshots with no sponsored messages due to ad blocking or failure to log in narrowed the sample to 43 subjects, 64 screenshots and 174 sponsored messages. Further elimination of duplicate ads resulted in a final sample of 42 subjects (21 male, 21 female), 62 screenshots and 140 sponsored messages—65 from Facebook and 75 from Twitter—for analysis. Sponsored messages were defined as messages occurring in the news feed that were labeled "sponsored" on Facebook and "promoted" on Twitter. Posts from followed or liked brands that were not labeled as sponsored or promoted were not included in the measure of sponsored messages. Ads occurring to the side of the news feed on Facebook were not included in the present analysis.

The methodology employed to study the sponsored messages was content analysis. Content analysis can be defined as "a scientific, objective, systematic, quantitative, and generalizable description

of communications content" (Kassarjian, 1977). Content analysis is frequently employed in studying social media posts. Tafesse & Wien (2017) provide a comprehensive summary of 13 published studies on brand posts, ten of which utilized content analysis. As recommended in content analysis, for variables where judgment was required, such as communication objective and tactic, two coders worked independently to determine the appropriate category. For objective variables such as site and numbers of likes, shares/retweets, and comments for each sponsored message, a second coder was employed to check items coded by the primary coder. Product categories were determined by first coding the specific sponsor and product (e.g., Pandora, internet radio) and then grouping products into categories (e.g., leisure/entertainment), guided by categories used in content analyses of advertising to similar audiences (Hanson, 2014; Morris & Nichols, 2013). In cases where a web retailer was promoting its site and a product, the category for the product being promoted was used. The resulting product typology captured 86% of the products in seven categories: apparel/accessories, food/drink, auto, technology, financial, health/beauty, and leisure/entertainment (e.g., movies, streaming services, and sports and celebrity websites). The three broad message objectives identified—information, transformation, and action— mirror the three components of attitude and are widely used, if differing slightly in definition and label. Our coding of message objective was guided by that of Taecharungro (2017): action objectives included sales promotions and other calls to action, information objectives included factual information and announcements, and transformational objectives (labeled emotion-inducing by Taecharungro) included imagery and sentimental or inspirational posts. Message tactics were determined in a process similar to that used by Tafesse & Wein (2018). First, an extensive list of tactics, brand post categories, and subtypes was derived from the literature. Next, an initial review of the posts was conducted to identify the most common tactics and any additional tactics not included. The final list included four commonly identified tactics—sales promotion, cause/institutional, image/experiential, and straight sell/functional—and one additional tactic, labeled curiosity. Curiosity was used to describe sponsored messages that enticed the viewer to click by arousing curiosity with tactics such as, "Which recipe is your state known for?" In cases where ads employed more than one tactic, the one most prominent was coded. Intercoder reliability, as measured by Cohen's kappa, was .83 for objectives and .64 for message tactics. These levels are considered "substantial" or better (McHugh, 2012). Discrepancies in categorizations were resolved through discussion.

RESULTS

Advertiser profile

The sample included 120 different advertisers across the 140 sponsored posts. Fifty-six percent of the advertisers were relatively new companies, defined as founded in 2000 or later, and only 12% were in the top 100 of US advertisers, as measured by Adbrands (Adbrands.net, 2015). There were no significant differences in advertiser age category or ad spending category by platform.

Descriptive statistics

Prior to testing our hypotheses, we compared differences in message strategy usage and overall engagement between the two social media sites. Tables 2 and 3 show the frequencies of message objectives and tactics for Facebook and Twitter. Action was most common objective and straight sell and promotions were most common tactics across both sites. There were no significant differences between sites.

Table 2 Frequency of Objective by Site		
Facebook	Twitter	Total

Action	83.1% N = 54	6.0% N = 57	79.3% N= 111
Information	9.2% N = 6	16.0% N= 12	12.9% N= 18
Transformation	7.7% N = 5	8.0% N = 6	7.9% N= 11
Total	100% N = 65	100% N = 75	100% N= 140
/2 = 1.46, p = .48			

Table 3 Frequency of Tactic by Site			
	Facebook	Twitter	Total
Cause/Institutional	4.6% N = 3	1.3% N = 1	2.9% N = 4
Curiosity	24.6% N= 16	18.7% N= 14	21.4% N = 30
Image	6.2% N = 4	6.7% N=5	6.4% N = 9
Promotion	33.8% N = 22	30.7% N = 23	32.1% N = 45
Straight Sell	30.8% N = 20	42.7% N=32	37.1% N = 52
Total	100.0% N = 65	100.0% N=75	100.0% N= 140
2= = 3.34, p = .50			

Table 4 shows mean likes and shares/retweets for Facebook and Twitter. Mean likes were greater than shares/retweets for both sites. Mean likes were significantly greater for Facebook than Twitter. Mean shares on Facebook were also greater than mean retweets on Twitter, but the difference not statistically significant.

Table 4 Mean Likes and Shares/Retweets by Site			
	Facebook	Twitter	Total
Likes	3077.18	620.72	1761.22
	N = 65 SD = 9826.72	N = 75 SD = 2077.57	N = 140 SD = 6947.72
Shares/Retweets	1191.22	285.32	705.91
	N = 65 SD = 4702.11	N = 75 SD = 1034.84	N = 140 SD = 3309.95
Likes * Site: F = 4.46, p = .04; Shares/Retweets * Site: F = 2.64, p = .11			

Hypothesis tests

Tables 5 and 6 show mean likes and shares by objective and tactic. The differences in likes and shares by message objective were not statistically significant; however, the difference in likes and shares by message tactic was significant, providing partial support to Hypothesis 1. The mean number of likes and shares was greatest for the strategy least frequently found in our sample, cause/institutional, while the strategy with the lowest mean number of likes and shares, the straight sell, was most frequently used.

Table 5 Mean Likes and Shares/Retweets by Objective				
	Action	Information	Transformation	Total
Likes	1997.08	871.22	837.55	1761.22
	N= 111 SD = 7714.19	N= 18 SD = 2251.44	N= 11 SD = 2183.91	N= 140 SD = 6947.72
Shares/Retweets	773.95	464.72	414.00	705.91
	N= 111 SD = 3649.71	N=18 SD = 1520.96	N= 11 SD = 1256.35	N = 140 SD = 3309.95
Likes * Objective: F = .31, p = .74; Shares/Retweets by Objective: F = .11, p = .89				

Table 6 Mean Likes and Shares/Retweets by Tactic						
	Cause/ Institutional	Curiosity	Image	Promotion	Straight Sell	Total
Likes	10828.50	4255.97	1254.56	1034.53	341.02	1761.22
	N = 4 SD = 11980.36	N = 30 SD = 13439.75	N=9 SD = 3173.15	N = 45 SD = 3207.11	N=52 SD = 684.05	N = 140 SD = 6947.72
Shares/Retweets	3349.00	2092.40	752.00	231.33	105.42	705.91
	N = 4 SD = 3825.17	N = 30 SD = 6766.72	N=9 SD = 2155.98	N = 45 SD = 922.46	N=52 SD = 253.61	N = 140 SD = 3309.95
Likes * Tactic: F = 3.60, p = .01; Shares * Tactic: F = 2.74, p = .03						

Tables 7 and 8 show the frequencies of message strategies by product category. Chisquare tests confirmed that there were significant differences in objectives and tactics across categories, thereby supporting Hypothesis 2a. Action was the most common objective overall. All of the health and beauty messages and ninety-two percent of the leisure product messages were action oriented. Sales promotion was the most frequently employed tactic for health and beauty products and apparel products; straight sell was the most frequent for financial and technology products; and curiosity was the most frequent for leisure products.

Table 7 Frequency of Objective by Product Category			
	Action	Information	Transformation	Total
Apparel/ Accessories	74.3% N = 26	11.4% N = 4	14.3% N=5	100.0% N=35
Automotive	20.0% N = 1	60.0% N = 3	20.0% N = 1	100.0% N=5
Financial	77.8% N= 14	22.2% N = 4	0.0% N = 0	100.0% N = 18
Food	57.1% N = 4	0.0% N = 0	42.9% N=3	100.0% N = 7
Health/ Beauty	100.0% N= 11	0.0% N = 0	0.0% N = 0	100.0% N = 11
Leisure/ Entertainment	91.7% N = 22	8.3% N = 2	0.0% N = 0	100.0% N = 24
Tech	81.0% N= 17	14.3% N = 3	4.8% N = 1	100.0% N = 21
Other	84.2% N= 16	10.5% N = 2	5.3% N = 1	100.0% N = 19
Total	79.3% N = 111	12.9% N = 18	7.9% N = 11	100.0% N = 140

'/2 = 34.90, p = .002

Table 8 Frequency of Tactic by Product Category						
	Cause/ Institutional	Curiosity	Image	Promotion	Straight Sell	Total
Apparel/ Accessories	2.9% N = 1	5.7% N = 2	11.4% N = 4	42.9% N = 15	37.1% N= 13	100.0% N = 35
Automotive	0.0% N = 0	0.0% N = 0	20.0% N = 1	20.0% N = 1	60.0% N = 3	100.0% N = 5
Financial	0.0% N = 0	27.8% N = 5	0.0% N = 0	22.2% N = 4	50.0% N = 9	100.0% N= 18
Food	14.3% N = 1	14.3% N = 1	28.6% N = 2	42.9% N=3	0.0% N = 0	100.0% N = 7
Health/ Beauty	0.0% N = 0	27.3% N = 3	0.0% N = 0	54.5% N = 6	18.2% N = 2	100.0% N= 11
Leisure/ Entertainment	0.0% N = 0	58.3% N= 14	0.0% N = 1	16.7% N = 4	25.0% N = 6	100.0% N = 24
Tech	0.0% N = 0	23.8% N = 5	9.5% N = 2	23.8% N=5	42.9% N = 9	100.0% N = 21
Other	10.5% N = 2	0.0% N = 0	0.0% N = 0	36.8% N = 7	52.6% N= 10	100.0% N= 19
Total	2.9% N = 4	21.4% N=30	6.4% N=9	32.1% N = 45	37.1% N=52	100.0% N = 140
$\chi^2 = 61.51$, p = .00						

Hypothesis 2b posits that product category moderates the effect of a given strategy on effectiveness. Following the test for moderation outlined in Baron & Kenny (1989), we performed a 2x2 ANOVA with likes as our measure of effectiveness and product category and tactic as independent variables. The effect of tactic on likes was significant ($\chi^2 = 10.02$, p = .04), but the interaction between tactic and product category was not significant ($\chi^2 = 17.93$, p = .33), thus H2b was not supported.

Hypothesis 3 posits that social media site moderates the effect of a given strategy on effectiveness. This hypothesis was also tested by performing a 2x2 ANOVA, as outlined above, with likes again as our measure of effectiveness, and tactic and site as independent variables. Social media site ($\chi^2 = 4.84$, p = .03), message tactic ($\chi^2 = 9.24$, p = .05), and the interaction between site and tactic ($\chi^2 = 10.64$, p = .03) were all significant, thereby supporting Hypothesis 3.

SUMMARY AND DISCUSSION

Given the interactive nature of social media, it was not surprising that action was the most common message objective. The mean number of likes for action-oriented posts was also more than twice that of informational or transformational posts, although the difference in effectiveness was not statically significant. A lack of statistical significance in this case should be interpreted with care, as the overwhelming dominance of action-oriented posts (79%) resulted in unequal sample sizes, which can reduce statistical power (Rusticus & Lovato, 2014). The difference in effectiveness by tactic was statistically significant. Cause-related posts garnered the most likes and shares. Although caution must be taken in generalizing the results as there were only four cause-related posts in our sample, the finding is consistent with recent research by Saxton, Gomez, Nigoh, Lin, & Dietrich (2019), who found that sharing was positively associated with messages that convey corporate social responsibility topics such as the environment or education. The tactic with the second most likes and shares, curiosity, represented over 20% of the sponsored posts and garnered more than twice the average number of likes and shares. The power of curiosity to increase consumer interest and learning (Menon & Soman, 2002) and predict purchase motivation (Hill, Fombelle, & Sirianni, 2015) in a simulated digital environment has been documented, so it is perhaps not surprising that it stood out as an effective strategy for engagement in the

present study. Curiosity as a social media tactic has not been specifically addressed in prior coding schemes and seems worthy of further attention. Interestingly, the most frequently used tactic, the straight sell, representing 37% of the posts, was the least effective, accounting for only 20% of likes and 15% of shares.

Consistent with earlier research on advertising (Kim et al., 2015; Laskey et al., 1995), our results showed that advertisers have different objectives and use different tactics according to their product category. In our study, apparel/accessories and leisure/entertainment were the most common products advertised and were more likely to utilize action-oriented messages. For apparel, the tactic was sales promotions, while for leisure products, like movies and sports or celebrity websites, tactics played on curiosity. However, unlike some previous studies, our results did not support significant differences in tactic effectiveness by product category.

Previous studies have found different message strategies to be effective for Facebook (Tafesse & Wein, 2018) versus Twitter (Taecharungroj, 2017). The present study provides further evidence that tactic effectiveness will differ depending on social media site by directly comparing effectiveness of tactics for Facebook versus Twitter and finding a significant interaction. Among the more frequent tactics, curiosity was the most effective on Facebook and sales promotion was the most effective on Twitter. The success of cause-related and curiosity tactics on Facebook and sales promotions on Twitter may be attributed to differences in the nature of their content. As described by Smith et al. (2012), Facebook's focus is on personal information while Twitter's content is more focused on news and information.

CONCLUSIONS

More than twenty-five years ago, in a study on television commercials, Laskey et al. reported that, "some strategies were found to be particularly 'popular' in a category in spite of the fact that they were also found to be relatively ineffective..." (1995, p. 39). The present study seems to suggest that the same holds true today for social media. While advertisers are pursuing objectives such as action and employing tactics such as curiosity that are well-suited to social media, some tactics that seem to have promise, like cause-related posts, may be underutilized, while others, like the straight sell, are very common and less effective. In addition, there were no significant differences in the tactics used in Facebook versus Twitter messages in our sample, in spite of the fact that there were significant differences in tactic effectiveness between the two sites. These findings suggest that, in spite of the social media data analytics available to brands, there are avenues to improve engagement that are not being utilized to their full extent. Social media analytics, while great at revealing which posts worked, are less helpful at determining why a post worked, and are typically limited to insights on owned brands (Yamaguchi, 2015). Studies that use human judgment, while limited in sample size, may be able to uncover qualitative characteristics that analytics cannot, and thus provide valuable insight into why certain posts work.

LIMITATIONS AND FUTURE RESEARCH

The research presented in this study provides a snapshot of message strategy and message effectiveness in sponsored posts drawn from news feeds of a narrow demographic sample, undergraduate college students. The sampling frame resulted in a smaller sample of posts than found in studies that draw from posts on the brands' own social media pages. However, one advantage of a sample drawn from news feeds is that it includes smaller brands, which have been largely ignored in previous studies that have naturally focused on leading brands' social media pages. As smaller brands represent a large volume of social media advertising, more research is needed on their social media use, and how it might differ from large global brands. Finally, given the rapidly changing social media landscape, replication and expansion

of the research is needed to better understand the advertising dynamics on Facebook and Twitter, and to investigate the growing number of new social media sites and the changes in advertising practices and effectiveness.

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A diversified role of Nanotechnology and nanorobots in field of pharmacy

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Abstract: Background: Nanotechnology is a field of science and artificial engineering dedicated to the design, manufacture, and use of structures and systems by manipulating atoms at the nanoscale and nanorobots are primarily nanodevices used for protection or treatment against human pathogens. It is designed to perform a specific task precision of 1100 nm and expected to operate at the atomic, molecular and cellular levels in the medical and industrial fields. Advances in robotics, nanostructures, medicine, bioinformatics and computing could lead to the development of nanorobots drug delivery systems. There are several areas in which nanotechnology plays an important role in uncovering the exact effects that may be associated with disease, agriculture and cosmetics. It has been used in many research projects that serve as a component of medicine or treatment.

Objectives: The main purpose of this article is to have more research on nanotechnology so that it can solve many problems in the world such as problems related to pollution etc. Nanotechnology will solve soil, health and nutrition problems on a large scale and will be accompanied by major revolutions or new changes in the world that people using this technology may response.

Conclusion: Henceforth, Nanotechnology plays a crucial role in number of areas such as the treatment of diseases used in agriculture, veterinary medicine as well as cosmetics. Thanks to nanotechnology, it had been able to combat many intractable elements since ancient times.

Keywords: - Nanotechnology, nanorobots, diseases, agriculture, vetnary, cosmetic

Introduction

Today, scientists around the world are working on practical medical nanorobots and nanotechnology. Nanotechnology is the combination of chemistry, physics, materials science and biology, to bring together the common expertise needed to develop these new technologies. Nanorobots can be used to repair damaged cells or replace them with affected intracellular structures [1]. They tend to self-replicate or replace DNA molecules in certain diseases [2]. Today, with the help of artificial intelligence, we can do a lot very easily. With the help of artificial intelligence, we can solve many factors in a very short time. It has the advantage of being able to cure various illnesses in a very limited time. This includes visual, speech recognition, and decision making. Studies have shown that nanorobots can act as antibodies or antiviral to treat patients with weakened immune systems [3]. With the help of nanotechnology and artificial intelligence, we can solve the problem based on agriculture, cosmetics, infertility. Through some changes, we solve many problems around the world. We are developing some machines that are used every day and can be useful to everyone. This allows you to eliminate different things in the world. These robots work in a variety of ways to help unblock arteries and reduce a person's heart attack rate. Some drugs are lipophilic and some are hydrophilic, which interferes with the treatment of patients[4]. The main problem we may face is drug absorption in specific areas. It has the advantage of being able to detect or record the changes they bring with the help of nanomachines / Nanomedicine [5].Nanorobots are wireless devices that, in some cases, give doctors the opportunity to change treatments when the patient's condition worsens [6]. These nanorobots tend to record activity throughout the brain and monitor pulse activity in the body small size, nanorobots can be used for several years without harming the body, are durable and have excellent effects. [8]. From scientists, we have successfully created artificial antibodies, red blood cells, artificial white blood cells, and antiviral nanorobots according to treatments that can be given to patients [9].

Working of nanorobots

After the nanorobots inserted they will operate on several parameters:

- Nanorobots navigation

- Powering the nanorobots

- Nanorobots locomotion

Nanorobots Navigation

The nanorobots are controlled by an external navigation system through ultrasonic signals given off by the display. The signals will pass through the body and back to the source [10]. The nanorobots are capable of emitting pulses of ultrasound waves/signals that doctors can detect using various sensors. The physician has control over the internal motives of the body [11]. Using magnetic resonance imaging, MRI physicians will be able to locate and track a nanorobots [12].The second method is that the scientist will add a radioactive dye to the nanorobots that move throughout the circulatory system, which we can use fluoroscopy and other devices to locate.[13][14] In addition, the nanorobots will be able to emit a radioactive dye that creates a pathway behind it as it travels throughout the body [14]. Other methods include radio waves, X-rays, and microwaves [15].

Powering the nanorobots

The nanorobots will be powered by blood flow, a nanorobot whose electrodes form a battery using electrolytes found in the blood [16]. The second alternative used by scientists is to use a small amount of a chemical that will act as a fuel source when it reacts with the blood [17]. A nanorobots will be able to generate heat through the patient's body, but it needs a regulator that can control the temperature. This effect is called the see back effect [18]. This is shown in figure (1).
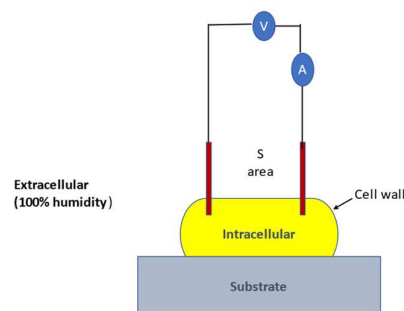

Fig.(1). How the nanorobots get power for the movement**.**

Nano-robots Locomotion

For the movement of the nanorobots, we need a strong propulsion system, because the nanorobots can move against the blood flow, so we need a relatively strong size [19]. The main considerations we have to take into account is that the nanorobots cannot damage the host as it travels through the blood [20]. The property used in nanorobots for mobility is the same as that used by bacteria. Bacteria will use flagella for movement, which will guide it for orientation and movement [21]. Israeli scientists have created microscopic robots that will have small appendages to grip and help crawl through blood vessels [22].

The Potential of nano-robots

The main purpose of nanorobotics is to diagnose and deliver drugs to cancer patients, complexity and intervention in medicine happen with replication of nanorobots, so non-replicating nanorobots are used in medicine to increase efficacy. This would include pharmacokinetics, diabetic monitoring and use in subsequent measuring devices [23]. It offers a wide range of technologies under development to deliver pharmaceutical drugs. Another use of nanobots is to repair and replace this problem and this cell. It can also utilize either inflammatory cells and white blood cells such as arteriosclerosis because they are 5 nm to 10 nm in size, which can easily break down plaques in the blood [24] [25].

Cure diseases with nano-robots

According to the scientists, the host will be able to adapt depending on the underlying disease and targeted immune responses to detect and treat infectious and non-infectious diseases [27].

Treatment of arteriosclerosis

Arteriosclerosis is a condition in which plaque builds up along the walls of the arteries. Nanobots may have the ability to reduce disease that will enter the bloodstream [28]. Prevent cancer: The scientist hopes to use nanorobots to treat cancer patients. The robots tend to attack tumours directly, or they can be used as drugs that label drugs directly at the cancer site, so that side effects are minimized without sacrificing effectiveness [29]. [30].

Treatment of gout

Gout is a condition in which the kidneys lose the ability to remove unwanted waste products from the blood [31]. Due to the deposition of waste in the ankle and knee joints, people will suffer from this. Nanorobots will be able to break the crystal structure and make it lighter [32].

Breaking kidney stones

Kidney stones are one of the painful diseases. The bigger the rock, the harder it is to overcome [33]. From fig.(2). we can understand how Doctors will able to break out by the using ultrasonic frequency with the help of nanorobots which can break out by using a small laser[34]
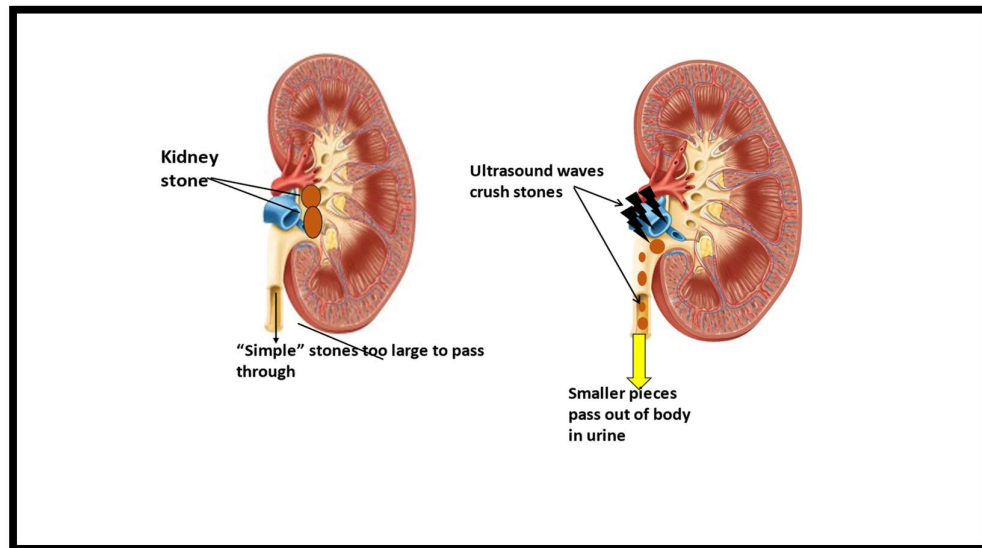
Fig.(2).Nanotechnology is used in the treatment of kidney stone.

Treatment of infertility

It is a disease that leads to fetal failure. This occurs in both men and women [35]. When the body is not able to produce sperm due to abnormal sperm function and there can be a blockage that interferes with sperm transport, it is the cause of male infertility [36]. When ovulation in women is out of balance for any reason, problems can arise in the regulation of reproductive hormones that may be controlled by the pituitary gland or the hypothalamus. These are the causes that cause infertility in women [37]. Nanotechnology has the potential to reduce infertility rates. With the help of nanotechnology, we can combat the pathways that cause infertility. We use nanotechnology to insert sperm into a woman's cervix when she is ovulating [38]. This process is also known as intrauterine insemination (IUI) or surrogacy. We can use artificial intelligence to select healthy sperm or mature eggs [39].

Diversified role of Nanotechnology in Pharmacy and different field

Nanotechnology in veterinary remedy

With the assist of Nanotechnology, we will capable of make remedy warmness resistant etc. By this we capable of deliver remedy to the ones animals which can be having unique weather condition [40].

Nanotechnology is an emerging field in cosmetics

Cosmetics are said to use substances to improve our skin and body parts. People have always been conscious of their skin since ancient times, they use natural substances like aloe vera, turmeric neem, etc., which shows the importance of cosmetics because of history [41], cosmetic The product was first used in Egypt around 4000 BC, evolution has continuously taken place in the cosmetic industry and now Nanoscience is becoming an important part of the cosmetic industry. Skin care products in the 21st century, products include skin care, hair care, colour cosmetics, personal or body care. The cosmetic sector includes cosmetics is a cosmetic industry sector that contains an active ingredient, it is considered between the cosmetic and pharmaceutical industries [42], solid lipid nanoparticles and nanoemulsions. Used as a nanocarriers to deliver the active ingredient of a cosmeceutical to the active site to enhance its therapeutic effect. Many cosmetic industries such as Lancôme, Avon, Loreal, Revlon use nanoparticles because they are cheap [43]. The skin is made up of many different layers: the stratum corneum, the epidermis, the dermis, and the subcutaneous layer. The routes of entry of topical cosmetic products are 1) Transcellular, 2) intercellular, and 3) follicular, so a small lipid substance can penetrate the skin [44]. Nanoscience is useful in many ways, such that because of the increased surface permeability of the particles increased in the deeper layers of the epidermis, the encapsulated active ingredient is protected against UV light [45.] and environmental conditions, due to the presence of capsules, the absorption of liquid in the body is less, resulting in low toxicity, bright skin for a certain time, and also used to treat wrinkles, dark spots and dry skin, etc. Along with the advantages, many disadvantages were also found in the research process, because the particle size is very small, they can sometimes interfere with the DNA or RNA of the population, so clinical trials are

not required can increase drug toxicity [46], with antibacterial and highly effective nanotechnology in cosmetics leading to dangerous side effects.

Nanotechnology used in agriculture

Crop improvement
- Np Mediated gene delivery.
- Abiotic and biotic stress tolerance.

Plant growth and yield
- There should be smart nanofertilizers

Storage and transport
- Using of barcoding for food product.

Precision agriculture
- Usingof smart nanosensor.
- robotics are used in the trweatment of plant
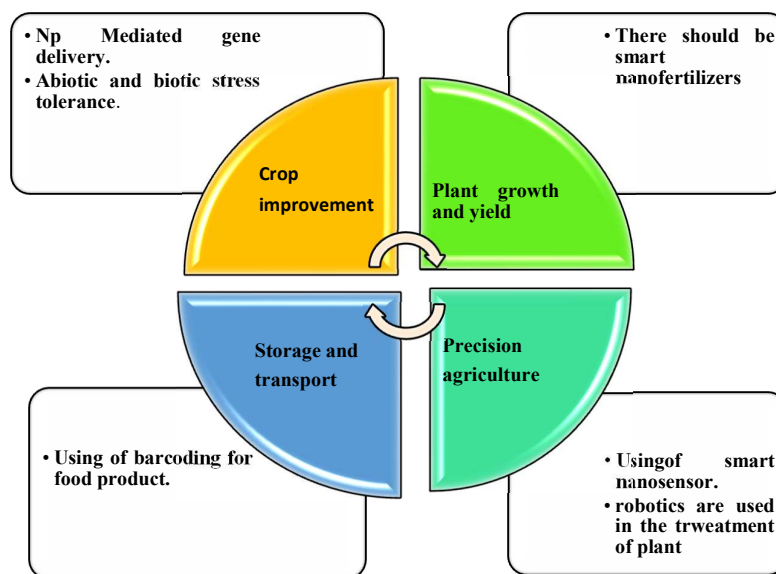
Fig.(3). Nanotechnology involved in the field of agriculture.

In terms of agricultureFig.(3)., it can play a supportive role in the welfare of a country. If we consider the current situation in the world, the demand for food is increasing due to the increasing population, the increasing demand for food by people [47]. If we look at the situation by conventional agricultural method, 20-30% of crops are damaged due to some conditions like microbial attack, pesticides and wind etc. [48]. Due to these, there should be a reduction in crop quality. With the help of nanotechnology, we can reduce these things. [49] Nanotechnology has been used for many years in the pharmaceutical field, in the treatment of various diseases such as cancer and arteriosclerosis. As today, nanotechnology can also be used in the agricultural sector. We cannot only depend on fertilizers for the best crop quality, but also have to choose from many different options [50]. Due to the high price of fertilizer, farmers cannot afford it, and fertilizer materials have many harmful effects on crops as well as human body [51]. Therefore, we must choose an alternative method that benefits plants as

well as humans. So with nanotechnology we can counteract all of this and can do the same in our daily use. If farmers do not apply the right amount, the crop is wasted, but too much fertilizer can be toxic. This will waste resources as well as increase the risk of pollution [52]. Nanotechnology will help farmers save water and reduce the use of agrochemicals in crops. With the help of nanotechnology, they will be able to monitor crops and let farmers know when crops need water and other needs. With the help of nanotechnology, they will increase the efficiency of absorption by being able to absorb more nutrients than before and the plants will be resistant to insects so farmers will have high yields [53].

Techniques used in nanotechnology for agriculture:-
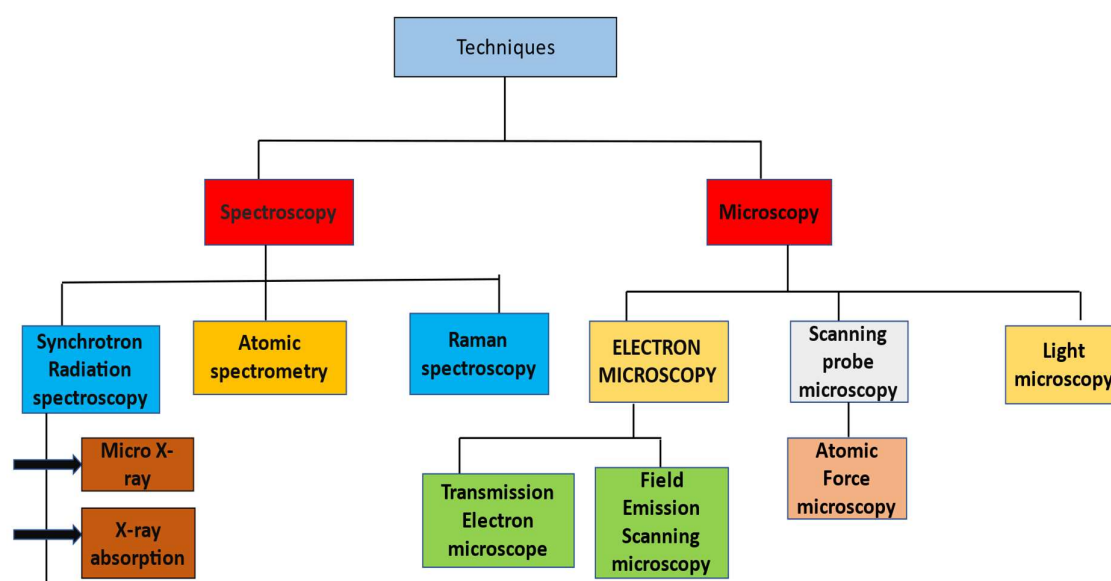
Fig.(4). Different techniques used in nanotechnology for agriculture determine the structure of a compound.

Miscellaneous role of Nanotechnology

Nanoparticle translocation in plants

Nanoparticle translocation on plants is entirely based on structure and morphology. The cell wall present in various plants may act as a barrier that can easily inhibit nanoparticles [54]. The nanoparticles are very small, about 3 nm to 5 nm, and can easily penetrate the roots. With the help of osmotic pressure and the forces exerted on the capillaries, they can easily

move on epidermal cells [55]. The cell wall of epidermal cells is translucent in nature and can contain very small particles. [56] After moving laterally, the nanoparticles need to move up in the xylem region. Nanoparticles can move from one cell to another through the process of plasmodesma. Another way nanoparticles can get inside is through stomata or cuticle-based leaves. The barrier faced by nanoparticles is the cuticle, which sometimes acts as the primary barrier and can only accept particles smaller than 5 nm in size. Therefore, larger nanoparticles can move within the cell [57]. It is important that the nanoparticles introduced into plants are highly pure and stable depending on the weather and environment.

Nanoparticle Interactions in Plants

The interactions between nanoparticles and plants can be positive or negative depending on the type of plant and nanoparticles. There are few routes through which nanoparticles can enter plants. B. Roots and leaves [58][59]. Scientists can investigate the effects of nanoparticles on plants using a variety of methods, such as foliar application and seed germination. As a result of research, it was found that high results can be obtained at a certain limit of nanoparticles[60]. Nanoparticles can increase the germination rate of seeds and the production rate of fruits. Nanoparticles have the ability to alter physiological processes within cells / plants [61]. They improve the absorption of nutrients in plants. The positive effects of nanoparticles can be explained as the absorption of more usable nutrients from fertilizers or soil water. Nanoparticles can control the photosynthetic effects of plants by controlling the levels of chlorophyll [62].

Nano fertilizer

Nano-fertilizers are products that can be obtained with the help of nanoparticles or through the use of nanotechnology to increase the effectiveness of nutrients in crops [63].The types of nano-fertilizer are as follows. a) Nanoporous zeolite b) Zinc nanofertilizer c) Nano herbicide d) Nano pesticides e) Boron nano fertilizer

Advantages of nano fertilizer

 a) High yields per hectare can be increased.

 b) The efficiency of nutrition utilization can be improved by 3%.

 c) The need for fertilizers can be reduced by up to 80%.

 d) Helps improve ground hold.

Nanotechnology used in animal

Nanotechnology in Animal Production

Dairy

Meat

Fisher

Insect

Cattle

Poultry

Food
purpose

Silkworm
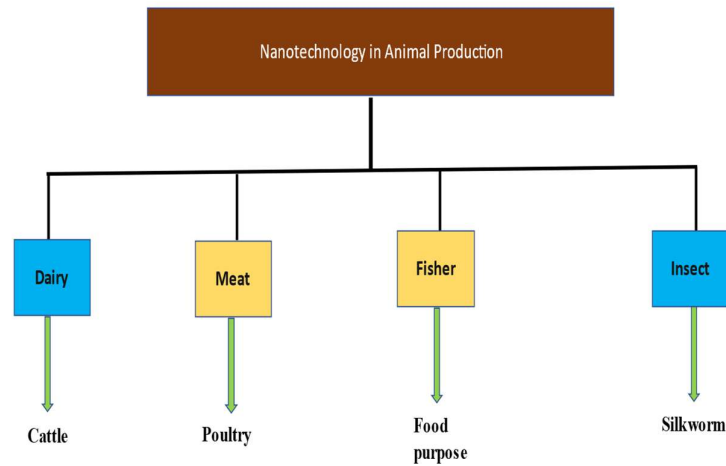
Fig.(6). Classification of the use of nanotechnology in the animals

Nanotechnology utilized in animal for numerous functions the primary motive of animal is used to do scientific trials of the approaching drug that's coming in market. The trial has to complete at the animals due to the fact to decide the side-outcomes and numerous impact which may be adverse [64]. Before the nanotechnology utilized in humans. They will do at the animals inclusive of huge and that`s to test the performance of it. From fig.(6).we need to additionally use of nanotechnology within side the manufacturing of animal inclusive of in dairy (milk manufacturing) and meat. It need to be a discover a mentor equipment to useful resource animal breeding [65]. It permits studies in new approaches and may capable of stumble on it in each situation inclusive of in vitro, or in vivo they also can be used for veterinary motive.

Nanotechnology in pottery manufacturing

Nanoform can act as a complement that could deliver with inside the poetry as though he did so one can in the end lessen the value of feed with the aid of using the addition of Nanoform[66]. We can normally produce the dissolving capacity of the fat-soluble

components used within side the meals products. This could have excessive performance in time period to apply the much less salt with inside the meat industry [67][68].

Lasers are used for skin conditions

Different types of skin conditions include different wavelengths of light. For example, wrinkles that have been removed at different wavelengths can cause many problems.[69]

Wrinkle

The wrinkle-removal term used for this procedure was "laser peel" prior to this technique, patients were advised to take medication for several weeks and take care of their skin before or after surgery but now due to the technique laser so these have been simplified.

Tattoos

Today Tattooing is a trend in the new generations, but sometimes due to the wrong use of ink and techniques by unprofessional workers, you can suffer pain, but now, due to laser machines, defective tattoos can be easily removed due to colour breakage without. leave scars. [70]

Hairs

Body hair can be easily removed in a few months using this technique. Lasers are less painful and faster. [71]

Different wavelengths are used for different skin types. As a result, using the wrong wavelength for a particular skin will lead to scarring, pigmentation, and problems such as irritation and itching. And for many other conditions, laser techniques are used.

Advantages

a) Best method used to remove the hair growth for longer period of time.

b) It is less painful as the treatment continues.

c) Good results are been observed.

d) Diode laser are effective for both light and dark skin.

e) Many hairs can be treated at same time for short areas. [72]

Skin analyser

It`s a tool utilized by dermatologist to are expecting or examine our pores and skin, it encompass exceptional assessments like of keratin protein, impurities, wrinkles, spots, sebum moisture and lots of more, on this system UV mild radiation is ship through the analyser deep into the pores and skin of stratum corneum and high-decision pics are captured through the analyser, the broken component in arise darkish in colour. [73]

1. The affected person delivers its facts of sort of pores and skin.

 2. The evaluation system to decide the sort of pores and skin of affected person: make-up of the affected person is eliminated absolutely than eyes and hairs are included to save you danger and following this are analysed:-

• Amount of loose water gift the layer of the pores and skin which offers the Hydration of our frame.

• Level of melanin with inside the frame of affected person that is an essential issue to decide beginning and DNA with inside the affected person.

 • Amount of sebum produced which decide the lipid level.

 • Determine how the oily and dry pores and skin and touchy pores and skin etc.

Sometimes this system can reason much harm to affected person like UV mild can intervene our DNA, most cancers may be caused, burning of pores and skin and etc.

Countries working on nanorobots

From Table 1. We can understand that China has the highest number of Nanoscience publications, more than 40% in the world, followed by the United States, India and Iran with the percentage of publications. Iran, Saudi Arabia and India give nanotechnology a higher priority to share articles on nano-science in publication.
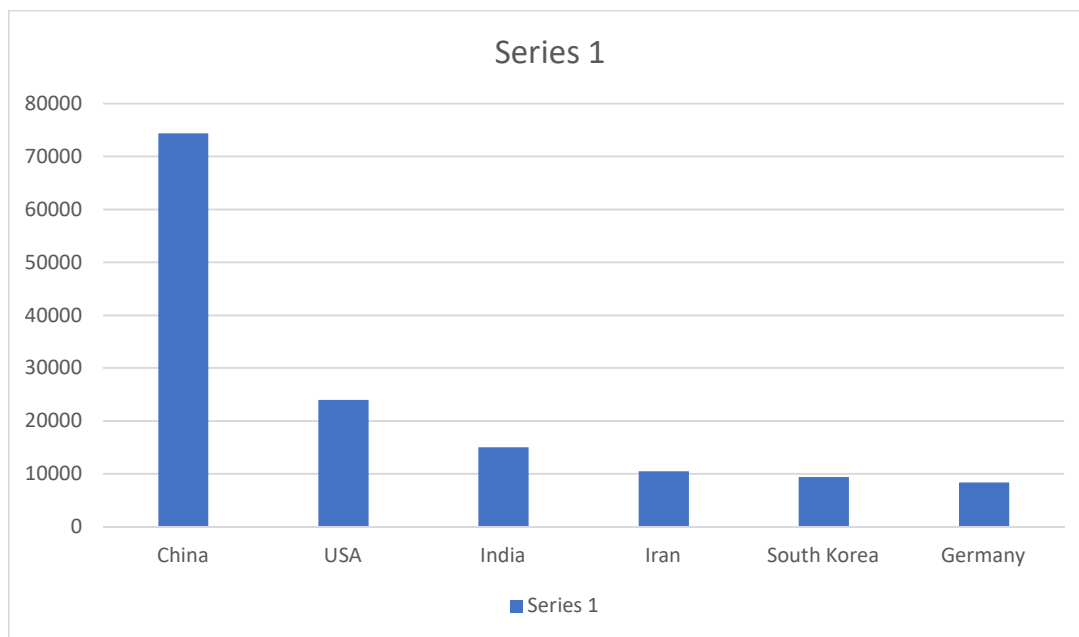
Table 1. Countries having highest nano-science.

Conclusion

Over the past half century or so, nanotechnology and nanorobotics has been the foundation for remarkable industrial applications and has grown exponentially. Nanorobots that monitor nutrient concentrations in a three-dimensional workspace are more likely a possible application of nanorobotics in the medical field than any other biomedical problem. Nanorobotics has great potential to dominate the medical field, treating diseases in the future. Thus, they changed the shape of the industry, expanding product development. Nanorobotics technology has come a long way, but the downsides that come with it make it less important. Therefore, we have to improve engineering to the point where we can hope that nanorobots with all its challenges and opportunities will be part of our future. For example, in the pharmaceutical practice communities, nanotechnology has had a profound impact on medical devices such as diagnostic biosensors, drug delivery systems, and imaging probes. In the food and cosmetic industries, the use of nanomaterials has increased dramatically to improve production, packaging, shelf life and bioavailability. Zinc oxide quantum dot nanoparticles exhibit antibacterial activity against bacteria in food, and the nanoparticles are currently being used as food sensors for food quality and safety detection. Today, nanotechnology has a daily impact on people's lives. The potential benefits are many and varied. However, given the significant human exposure to nanoparticles, the potential health and environmental hazards are of great concern. These concerns have led to the emergence of complementary

sciences, including nanotoxicology and nanomedicine. Nanotoxicology is the study of the harmful health effects of nanoparticles. Nanomedicine, which includes sub disciplines such as tissue engineering, biomaterials, biosensors and biomodels, was developed to study the benefits and risks of nanomaterials used in medicine and medical equipment. Some of the potential benefits of medical nanomaterials include improved drug delivery, antibacterial coatings for medical devices, reduced inflammation, and better healing of surgical tissues and detect circulating cancer cells. However, due to the lack of reliable toxicological data, the potential for human health effects continues to be of great concern.

Discussion

The multidisciplinary field of nanotechnology brings the science of the almost incomprehensible small device closer and closer to reality. The impacts of these developments will, at some point, be so great that they have the potential to affect almost every area of science and technology. As such, nanotechnology is the technology that has brought about the greatest technological breakthroughs in history. Here, several developments in the field of nanotechnology are presented, with particular emphasis on those that have the potential to produce rapid medical advances. Above all, the scope of the promising developments and some not yet discussed, including new liposome-based technologies. Nanorobots used in medicine hold great promise. When taking into account the serious side effects of existing therapies, nanorobots have proven to be more innovative, advantageous for the treatment and diagnosis of life-threatening diseases. Respiration cells are said to be 236 times faster than normal red blood cells. Nanorobotics has great potential in the diagnosis and treatment of various pathologies such as cancer, heart attack, diabetes, arteriosclerosis, kidney stones, etc. Nanorobots can allow us to personalize treatment, thus achieving high efficiency in combating a wide range of diseases. To solve the problem, the scientists investigated biological and biomimetic approaches and engineering mechanisms for the movement of nanorobots by mimicking bacterial structures or using motors. Biology can convert chemical energy into rectilinear or rotational motion. In addition, it will be necessary to implement micro-fabrication technology capable of mass producing large nanorobots at low cost and with the ability to precisely control the shape/dimensions of structures and components. Therefore, inspired by natural organisms and depending on the site of application and target cells, nanorobots are indeed expected to have a significant impact on the life/care of patients with a number of diseases. While many scientific groups with medical, pharmaceutical or engineering backgrounds have designed nanorobots small enough

to enter the bloodstream, the field remains a fantasy due to the lack of well established technology. to build systems specifically for biomedical applications; however, in the long run, it is possible that all these limitations will be overcome and so nanorobots will become ubiquitous in medicine.

Abbreviation:

MRI:- Magnetic resonance imaging.

DNA: Deoxyribonucleic acid

RNA:- Ribonucleic acid

UV:- Ultraviolet

IUI:- Intrauterine insemination

Consent for publication

Not applicable

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Conflict of interest

The authors declare no conflict of interest, financial or otherwise

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An Aspect on Rational Use of Drugs and Comprehensive Care among Rural Mass

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Abstract

Drug information is the basis for the development of tools essential for rational prescribing and use such as formularies, standard treatment guidelines and consumer information. Rational use of drugs is multifaceted. Its medical, social, and economic aspects are well reflected in the World Health Organization (WHO). Effective work-related health care demands an experienced and comprehensive combination of staff, facilities and services. Health promotion is knacks of assisting people to enhance their motivation to strive for optimal health and supporting them in altering their lifestyle to move toward a state of finest health. In India health alertness among the mass is being propagated from side to side through several media such as television, radio, newspaper, health-camp and hoardings etc. Often a question arises: Are people aware about rational use of Drugs? Apart from this, are these people getting comprehensive care? The general opinion was assembled from people and signaled that a large section of people were aware regarding rational drug use and Comprehensive care up to significant level. On the other hand, people were not very sure about prevention and treatment of disease, palliative care, drug use patterns (any problems about medication) such as over prescribing, multi drug prescribing, misuse of drugs, and use of unnecessary expensive drugs. Conclusive remarks were assessed after collecting the data in terms of response of different query among rural mass. Results were obtained using simple statistics. Thus these restraining features need consideration and reflection in deeds.

Key words: Rational use, Patient counseling, OTC, Comprehensive care, Disease

Introduction:

The concept of rational drug use during the past few years has been the theme of various national & international gatherings. Various studies conducted in developed as well as in developing countries during past few years regarding the safe & effective use of drugs.[1] Rational use of drugs requires that patients receive medications appropriate to their clinical needs in doses that meet their own individual requirements for an adequate period of time, at the lowest cost to them and their community[2] .Community pharmacists have always played a significant role in promoting, maintaining, disease prevention and improving the public health based at the heart of communities. They gain a unique understanding of the health needs of the communities. They serve through daily interactions with patients and customers and help in "availability of effective quality health, disease prevention services" as well as the urgency to develop public health policy [4]. Appropriate patient counseling by pharmacists having widening scope for self medication bringing different challenges such as communication in depth subject knowledge proper application and helping attitude. One concept underlying many public health activities is prevention of disease, which is commonly categorized into three types: primary prevention (reducing the actual incidence and occurrence of diseases, injuries, and

disability), secondary prevention (decreasing the severity or progression of the disease, injury, and disability), and tertiary prevention (treatment or rehabilitation to return the disease, injury, or disability to the initial or baseline state) [3]. Community pharmacists can be involved in disease prevention and control in many ways like as they can help to develop institutional screening programs, check immunization status and identify undiagnosed medical conditions (e.g., hypertension, diabetes, hyperlipidemia, depression). Diseases ground premature death as well as structural/functional limitations. They seriously affect the quality of life. Assessment of quality of life provides a measurement of well being and focuses on aspects of a patient's life beyond symptoms and signs. Comprehensive care is the concurrent prevention and management of multiple physical and emotional health problems of a patient over a period of time in relationship to family, life events and environment. Intensive efforts have been made to comprehensive care and health services. Health promotion assists people to enhance their motivation to strive for optimal health and supporting them in altering their lifestyle to move toward a state of optimal health (balance of material, emotional, communal, spiritual and intellectual health). Lifestyle transformations are usually through an amalgamation of experiences that enhance awareness, increase motivation . In India health alertness among the mass is being propagated from side to side through several media such as television, radio, newspaper, health camp, holdings. Home-based care has a variety of typologies, each representing a different delivery scheme, mix of services, staff and reach. Some of the more identified types include facility-based and community-based. The emphasis on each type of program tends to differ[5] . To ensure that the foregoing benefits are realized, home-based care should be regarded as a holistic system of care.[6] Lack of palliative skill for home based care may increase hospital admissions for care at the very end of life. As population age, the pattern of diseases that people suffer and die from also changes.[7] Health-system pharmacists can promote public health by developing patient education programs on safe and effective medication use and other public health-related topics, such as tobacco cessation, exercise, and healthy nutrition. Pharmacists should support the health education and training of the population at an early age, such as through school health programs to help children develop good health behaviors that can continue into adulthood. Health-system pharmacists can also use their knowledge and expertise to educate community leaders about public health and involve them in public health initiatives.[8, 14]

Objectives:

The specific objectives were to promote the information regarding rational use of Drugs and comprehensive care among rural mass. Rational use of drugs carries source of medication, instructions from dispenser regarding medication, side effect of medication, contraindication of medication, Information regarding prevention or care about health and drug use patterns (problems about medication). Apart from this comprehensive care , family planning, vaccination, balanced diet, disease prevention, health promotion, health education, patient counseling, health screening, treatment of disease, Palliative care and home based care should be taken up. Information regarding rational use of Drugs and Comprehensive care among rural mass in a village Barabanki of Uttar Pradesh, India province was gathered during community visit as dated on 10 November 2012 by Department of Pharmacy, Sagar Institute of Technology and Management, Barabanki.

Methodology:

Information was collected from 234 persons comprising of 114 men (21-80 years of age) and 120 women (21-80 years of age). Information were collected from eight teams each consisting of three persons. Each team included a supervisor and two interviewers (one female and one male). Interviewers asked questions regarding rational use of Drugs and Comprehensive care consisting various queries as shown in table 1 and table 2 respectively. The responses of people were recorded as positive (Yes) or negative (No).

Results:

Table1. Responses of mass regarding awareness about Rational drug use

S. No.	Query: Are you aware about:	Yes (%)	No (%)
1.	Source of medication	90	10
2.	Instructions from dispenser regarding medication	74	26
3.	Side effect of medication	47	53
4.	Contraindication of medication	40	60
5.	Information regarding prevention or care about health	83	17
6.	Are you facing any problems about medication	52	48

Each value represents average of response in terms of percentage either yes or no.

Table2. Responses of mass regarding awareness about Comprehensive care

S. No.	Query: Are you aware about:	Yes (%)	No (%)
1.	Disease prevention	59	41
2.	Health promotion	87	13
3.	Health education	85	15
4.	Patient counseling	40	60
5.	Health screening	83	17
6.	Family planning	88	12
7.	Treatment of disease	65	35
8.	Balanced diet	83	17
9.	Palliative care	55	45
10.	Vaccination	91	09
11.	Home based care	83	17

Each value represents average of response in terms of percentage either yes or no.

Fig. 1 Responses of mass regarding awareness about Rational drug use

**Fig. 2 Responses of mass regarding awareness about Comprehensive care**
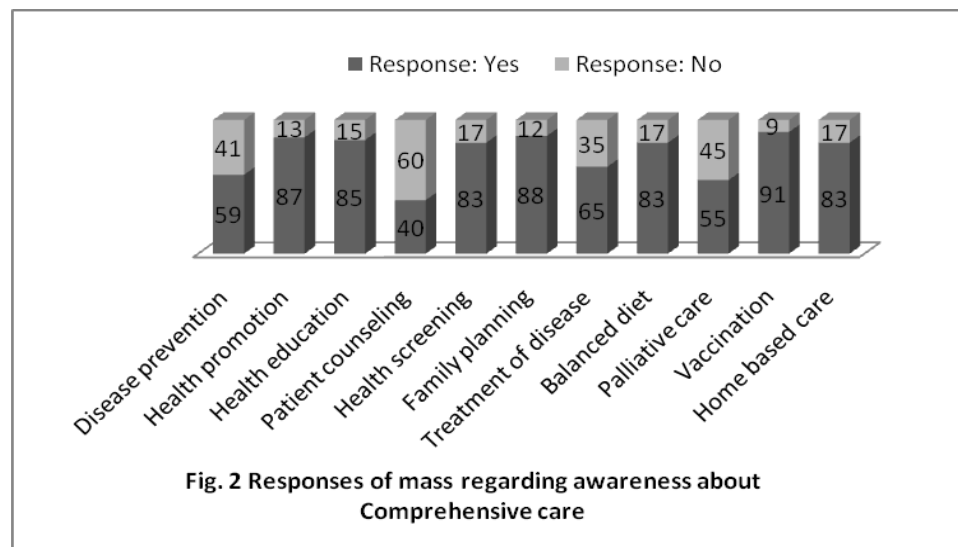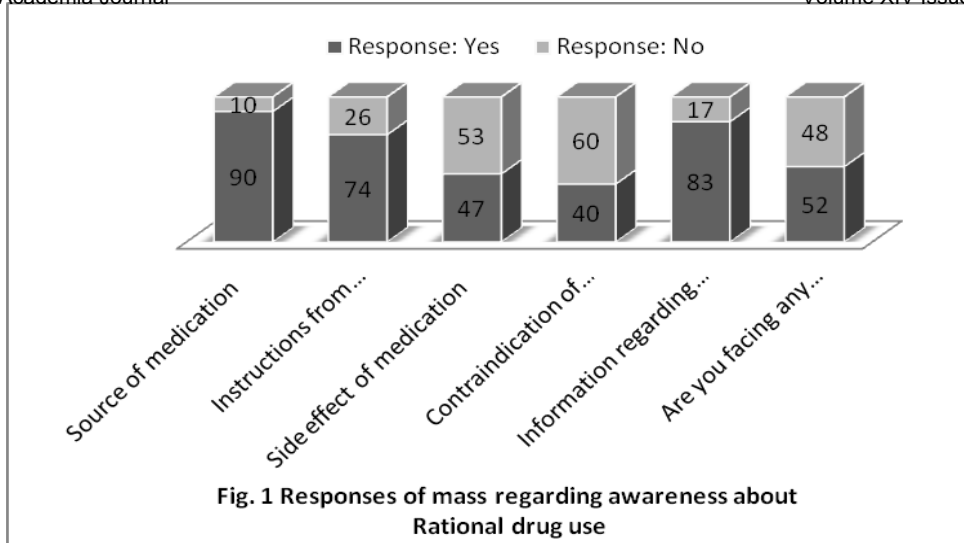
Discussion:

Rational use of OTC drugs is very important and requires the same systematic approach as for different prescribed medicines. Collaborative care could bring Pharmacist, Doctors and patients to a plateform where there is a need to discuss how they will respond to self medication practices, and ways of motivating pharmacist for advising patients need to be found.[9] Interventional areas that have unique implications for older patients include immunizations, diet, exercise etc.

Health trends in the next 25 years will be determined mainly by factors such as mortality rates from communicable and non communicable diseases, maternal, prenatal and nutritional disorders.[10] India has declared year 2012 as the year of intensification of routine immunization. The present full immunization coverage of children is 61%.[11] Universal Immunization Programme is a vaccination program launched by the Government of India in 1985. The program consists of vaccination for six diseases; tuberculosis, diphtheria, pertussis (whooping cough), tetanus, poliomyelitis, and measles. Government of India has also expanded the Universal Immunization Progranme (UIP) by introducing 2nd dose of Measles, Hepatitis B

and Pentavalent vaccination. Vaccination burden of unintended pregnancy is still large for diseases such as measles, poliomyelitis and neonatal tetanus significantly reduces mortality and morbidity attributable to these diseases.[12,13] Childhood underweight is one of the leading cause of malnutrition is generally assessed by comparing the food energy intake of persons as compared to proposed norms as per WHO. Macronutrients and micronutrients and multivitamins are essential component of Balanced diet. To prevent or minimize malnutrition problem in developing countries, nutrition programme have embraced the provision of nutritional supplements which are embedded with macronutrients and micronutrients and multivitamins to the people. An attempt to enliven family planning accompanied by methodical and gradual effort to promote maternal health services over several years is as lucrative as childhood immunization or treatment of disease. In many countries, uptake of modern contraception is controlled by limited access and weak service.[10]

Interventional areas that have unique implication regarding public health activities are prevention and treatment of disease either communicable or non-communicable disease, which is commonly categorized into three types: primary prevention, secondary prevention and tertiary prevention.[3] We need to know the incidence and prevalence rates as knowing the incidence and prevalence rates enables us to interpret disease epidemiologic patterns and hence plan for interventions can be executed. The disease progression can also be delayed by following a healthy life style. Community Pharmacist plays a vital role in maintenance of health screening programs via sharing knowledge between community people to check immunization status and identify undiagnosed medical conditions (e.g., hypertension, diabetes, hyperlipidemia, and depression).[6] Medication reconciliation programs are one example of the tools pharmacists can encourage their facilities to use to achieve these goals.

Based on the results of the survey, which identified responses of mass regarding awareness about rational drug use as shown in Table1. The dominant response were observed in the area like source of medication (90%), instructions from dispenser regarding medication (74%), side effect of medication (47%), contraindication of medication (40%), information regarding prevention or care about health (83%) and are you facing any problems about medication (52%). In addition, community pharmacist should be more interactive with community people in order to bring improvement in health status of individual among rural mass.[10] Apart from this comprehensive care carries the congregated information gestured (Table2) that a bulky section of people are sentient about disease prevention (59%), health promotion (87%), health education (85%), patient counseling (40%), health screening (83%), family planning (88%), treatment of disease (65%), balanced diet (83%), palliative care (55%), vaccination (91%) and home based care (83%). This may be the result of the reach of the various health awareness programs organized by government/non-government organization to the people.

On the other hand, people were not very sure about drug use patterns (any problems about medication) such as over prescribing, multi drug prescribing, misuse of drugs, and use of unnecessary expensive drugs ; replied (Yes =52 %). Also people were not aware about the palliative skill for home based care (palliative care; Yes= 55%) and prevention and treatment of diseases in locality (Yes =59% and Yes =

65%).Thus, special attention to be given by health care professionals among rural mass .Consequently awareness related to palliative care and prevention and treatment of diseases in the locality are required. Therefore more effective care of old age patients should be stressed as to benefit every person of society in more elaborated manner. It can not be overruled that due to limited sample study, an elaborated study is required as to have findings in a more elaborated way.

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A Wide-ranging Study of Goods and Services Tax (GST) in India

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Abstract

The Goods and Services Tax (GST), carried out on July 1, 2017, is viewed as a significant tax collection change to date executed in India since its freedom in 1947. GST was wanted to be carried out in April 2010 however was deferred because of policy-centered issues and the clashing interests of partners. The essential objective behind the advancement of GST is to subsume a wide range of circuitous expenses in India like Focal Extract Duty, Tank/Deals Assessment, Administration charge, and so forth and carry out one tax collection framework in India. The GST-based tax assessment framework carries more straightforwardness to the tax collection framework and expands the Gross domestic product rate from 1% to 2% and diminishes charges of burglary and defilement in the country. The paper featured the foundation of the tax collection framework, the GST idea alongside critical working, correlation of Indian GST tax assessment framework rates with other world economies, and furthermore introduced inside and out inclusion in regards to benefits to different areas of the Indian economy in the wake of levising GST and illustrated a few difficulties of GST execution. Key words: tax, indirect tax, goods and services tax (GST), taxation reforms, Indian taxation system, GST Council

The word "tax" is derived from Latin word "taxare" meaning to estimate. A tax is not a voluntary payment or donation, but enforced contribution, exacted pursuant to legislative authority and is contribution imposed by the government, whether under the name of toll, tribute, impost, duty, custom, excise, subsidy, aid, supply, or any other name (Chakraborty & Rao, 2010 ; Garg, 2014).

Taxation was first imposed in Ancient Egypt around 3000 B.C.- 2800 B.C. during the first dynasty of the old kingdom. Records indicate from that period that the Pharaoh would conduct a biennial tour of the kingdom, collecting tax revenues from the people. Other data indications are granary receipts on limestone flakes and papyrus.

Taxes are the only way for financing the public goods because of their inappropriate pricing in the market. It can only be levied by the government, via funds collected from taxes. It is highly important that the taxation system is designed in such an appropriate manner that it doesn't lead to any sort of market distortions and failures in the economy. The taxation laws should be highly competitive so that revenue can be raised in a highly efficient and effective manner.

In India, the taxation system was started in ancient times. The early taxation system's existence can be seen in many ancient books like *Manu - Smrti* and *Arthasastra*.

During the British empire, the entire taxation system of India was transformed. It was entirely in favor of the British empire, but it also incorporated modern and scientific techniques of taxation systems. Another remarkable transformation came in the year 1922 in the taxation system when Britishers established an entirely new administrative and taxation system in India. In this system, the taxation system was categorized in two main categories: Direct Taxes and Indirect Taxes. In India, the taxation system is entirely controlled, imposed, and updated by Central and State governments. The authority to levy tax is derived from the Indian Constitution, which allocates the power to levy taxes between Central Government System and State Government System.

The Indian Taxation System - Scenario Before GST

Tax policies play a vital role in any country's progress and have a direct impact on any country's economy in terms of efficiency and equity. A good taxation policy is that which takes care of the entire income distribution and also generates tax revenues in such a manner for Central and State Governments, which can lead to overall benefit in the nation's infrastructure, defense, public amenities, people's security, and a country's exports.

The entire framework to impose indirect taxes comes under Constitutional provisions of India. Article 246, Seventh Schedule gives the right to Central and State Governments to levy taxes and collect indirect taxes on the basis of goods and services transactions. The taxation system varies from manufacturer to manufacturer on point of sale or level of imports or exports. Indirect taxation based collection systems are based on origin, and are designed to impose tax and collect the same at the event of happening of any taxable activity.

The Figure 1 depicts a tabular representation of Indian indirect taxation system as per Article 246 of the Indian Constitution System. The following Table 1 gives a tabular representation of taxes imposed and collected by Central and State Governments of India.

(1) Journey of Indirect Taxation Tax & Important Turning Points in India : The following points highlight the

Figure 1. Indian Indirect Taxation System as per Article 246

Source: Reproduced from Jain (n.d.) from https://www.caclubindia.com/articles/goods-and-st-basics-25424.asp
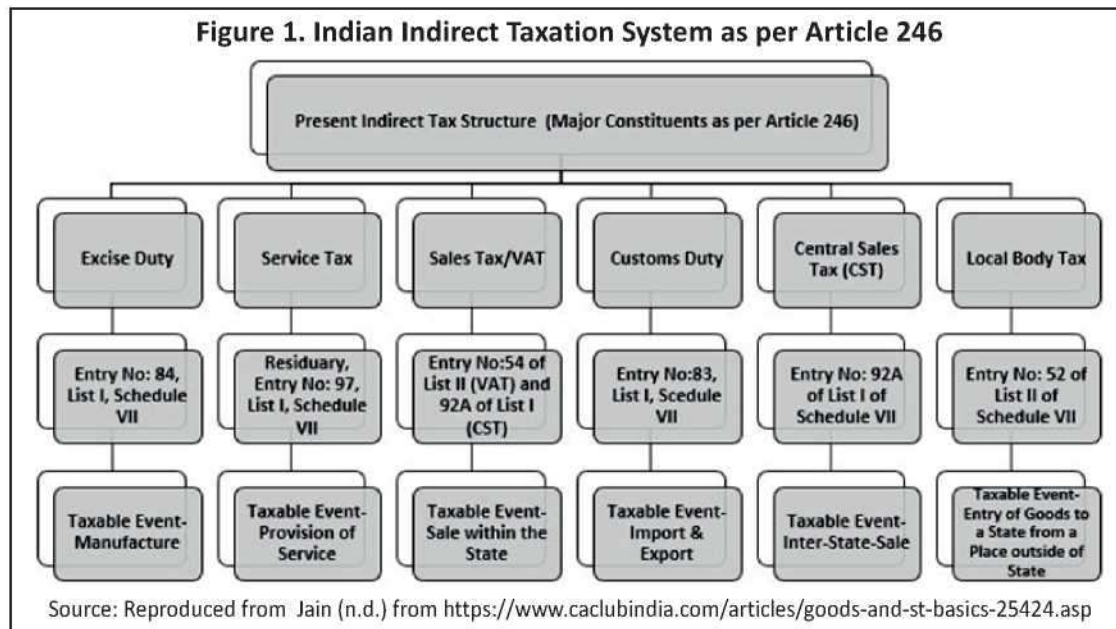
Table 1. Taxes Imposed and Collected by Central and State Governments in India

Name of Tax	When it was Imposed?	Imposed by	Collected by
Central Excise Duty	Goods manufactured in India (Excluding Goods manufactured in SEZ in India).	Central Govt.	Central Govt.
Service Tax	Any sort of service in territory (wherever applicable).	Central Govt.	Central Govt.
Sales Tax / VAT	Sales of Goods within state.	State Govt.	State Govt.
Customs Duty	Import of goods to India from any place outside Indian Territory or Export of goods outside Indian Territorial Border.	Central Govt.	Central Govt.
Central Sales Tax (CST)	Inter-State goods sale.	Central Govt.	State Govt.
Local Body Tax (Entry/Octroi)	Goods entry to a state outside of state.	State Govt.	State Govt.

journey of Indian indirect taxation and turning points, which reformed the taxation system till date before the introduction of GST taxation system in India.

1974: Report of LK Jha Committee suggested introduction of VAT system.

1986: Introduction of restricted VAT called "MODVAT".

1991: Chelliah Committee report recommended "VAT/GST" and recommendations accepted by the Government.

1994: Service Tax introduction.

1999: Empowered Committee formation on State VAT.

2000: Introduction of Uniform Floor State Tax Rates and abolition of tax-related incentives granted by State Governments.

2003: Implementation of VAT system in Haryana.

2004: Strong progress towards introduction of CENVAT.

2005-06: Implementation of VAT based taxation system in 26+ states in India.

2007: First GST Stuffy released by Mr. P. Shome in January; Finance Minister speech carries the introduction of GST in Budget; CST phase out starts in April 2007; joint working group created and reports submitted.

2008: EC rolls out the GST Structure of Taxation System in April 2008.

2009: Date proposed for Implementation as April 1, 2010.

2010: Department of Revenue commented on GST discussion paper and finance minister suggested probable GST rate.

2011: Team was created to lay down the road map for GST and 115th Constitutional Amendment Bill for GST was laid down by the Parliament.

2012: Negative list regime for service tax was implemented.

2013: Parliamentary Standing committee submitted its report on the Bill.

2014: 115th Amendment Bill lapsed and was reintroduced in 122nd Constitutional Amendment Bill.

(2) Limitations and Issues Pertaining to the Existing Indian Taxation System : Various taxes are imposed on the Indian population by Central and State Governments like Central Excise, Service Tax, VAT, etc. Before the introduction of VAT in Sales Tax and CENVAT in Central Excise and Service Tax, the Indian Taxation System was very complex and this had cascading effects. The tax imposed on one destination was also taxed on another destination. However, in recent times, the taxation system has seen remarkable revolutions.

Many changes in taxation were implemented, that is, VAT, and implementation of Service Tax by Central Government. In Central Excise taxation system, the government introduced CEVAT by setting off taxes on inputs, while producing output products. With introduction of VAT based taxation system in India, the foundation stone of GST implementation was laid.

The following points highlight the primary and severe issues pertaining in Indian indirect tax structure system :

(i) The CENVAT (excise duty) was imposed on the products manufactured in India. But issues originated regarding product valuations. The issue regarding implementation of CENVAT only at the manufacturing level acted as a critical barrier to efficient and neutral flow of tax credit. This led to the replacement of VAT to GST in many countries.

(ii) The Indian Constitution has distributed the taxation system between Central and State Governments. The State government has right to impose any sort of tax on any matter or item under the state. In Service Tax, the Central government enjoys the power to impose tax but in Work Contracts, the State government has the dominance. This sort of system creates distortions in revenue generation and distribution for the government.

(iii) Various things like copyrights, patents, software are not considered for taxation system by the government. So, complexity again arose for classifying these goods under the taxation policies.

(iv) With the booming of the service sector, the Central government has monopolistic right to impose tax. The State Governments, on the other hand, are losing their revenue by not imposing any tax on the service sector.

(v) Considering CST on inter state sales of goods, no set off was allowed, which increased the cascading effect.

(vi) For better monitoring and administration of taxes, major transformations in technology are required, which is costly and time consuming and has to be redressed.

(vii) Lack of cross verification of returns filed under Central and State taxation systems led to lot of discrepancies.

(viii) Under the Indirect taxation system, there were more than 15 different taxes which had to be filled under different norms. So, it required immediate and one system regulation of filling and calculating taxes.

(ix) The Indian taxation system was cumbersome and full of burdens and different taxes on same products in

different states led to high inflation, which had to be redressed.

Despite of the existence of multiple taxes in the Indian Economy like Excise Tax, Custom Duty, Service Tax etc., still the GDP of India is much less as compared to the GDP of other countries like USA - 13.84%, China - 6.99%, Japan - 4.3%, and France - 2.05%. So, the GDP data of various countries demonstrates that there is utmost need of tax reform, that is, implementation of Goods and Services Tax (GST) in India.

Research Methodology

This paper is based on exploratory research technique and data cited in this paper were collected via secondary sources available like statistical data available on various websites of Indian Government like Finance Ministry (finmin.gov.in), GST Council (gstcouncil.gov.in), GST Council Archives (gstindia.com), and many more ; literature review from journal papers ; annual reports ; newspaper reports ; and wide collection of magazine based articles on GST. Based on the analysis of above mentioned data collection sources, the objectives of the study are defined and research design is drafted which is highly descriptive in nature.

Objectives of the Research Undertaken

The research has been undertaken and presented considering the following foremost objectives :

^ To gain an in-depth understanding of GST taxation system evolution.

^ Understanding in - depth the concept of new taxation system introduced - Goods and Services Tax (GST) in India.

^ Understanding the features, working, and differentiating the current taxation system in India v/s GST.

^ To evaluate the advantages and challenges surrounding GST.

^ To evaluate the prospects of taxation position of various goods and services in India.

^ To furnish the information for future research on GST based taxation system.

Scope of the Study

This paper provides a detailed insight regarding implementation of GST tax among various sectors of the country. GST after implementation will bring uniformity with tax rates and will also overcome lots of shortcomings in the Indian taxation system with regard to indirect taxation. The Good and Services Tax would surely be highly advantageous for major areas of the India economy.

Goods and Services Tax (GST) - Current Scenario

(1)   Need for GST- Goods and Services Tax : As per the reports of Task Force on Goods and Services Tax (2009), the Indian taxation system led to misallocation of resources and lower productivity in terms of economic growth, international trade, and overall development of the Indian economy. Therefore, there was an emergent need to replace the existing tax system with a new engine of taxation of goods and services to attain the following objectives (Roychowdhury, 2012) :

^ The tax incidence fell primarily on domestic consumption.

^ The optimization of efficiency and equity of the Indian system is desired.

^ There should be no export of taxes across the taxing jurisdiction.

^ The Indian market should be brought under a single umbrella of common market.

^ Enhancement to the cause of cooperative federalism.

Apart from the above listed objectives, Kelkar (2009) summarized the overall advantages of implementation of GST in India as follows:

It will bring about a phase change on the tax firmament by redistributing the burden of taxation equitably between manufacturing and services. It will lower the tax rate by broadening the tax base and minimizing expectations. It will reduce distortions... [and] foster a common market across the country and reduce compliance costs. It will promote exports. Perhaps more importantly, it will spur growth. (para 1)

(2) Introduction to the Goods and Services Tax (GST) : New Article 366 (12A) of the Indian Constitution (GST India.com, 2016) defined Goods and Services Tax (GST) to mean any tax on supply of goods or services or both except taxes on the supply of alcoholic liquor for human consumption. New Article 366(26A) defines service to mean anything other than goods. Existing Article 366(12) defines goods to include all materials, commodities, and articles.

As per the government, the Goods and Services Tax (GST) is regarded as a *'Reform'* rather than amendment in

the existing Indian taxation system to sort out all backdoors and cons of the indirect taxation system. India was one of the 123 countries in the world following the VAT taxation system. VAT was designed and introduced on January 17, 2005 at the Centre and State levels by finance minister P. Chidambaram. VAT replaced Central Excise Duty Taxation at the national level and Sales Tax System at the state level, bringing major reform in the taxation system.

Goods and Services Tax (GST) was proposed in 2014 to be implemented with effect from (w.e.f) June 2016. The GST implementation is "dual" in nature - one component is implemented by Centre (CGST) and another component by State (SGST). The base of tax would be the same by Centre and State governments. GST came into effect in India on July 1, 2017. With some major modifications, the GST would now have three prime models :

(i) Central GST : GST to be levied by the Centre.

(ii) State GST : GST to be levied by the States.

(iii) Dual GST : GST to be levied by the Centre and the States concurrently.

GST is regarded as a comprehensive and one tax system on manufacture, sale, and consumption of goods and services at the national level. As GST is implemented, all other taxes have been discontinued. There is now one tax, that too at the national level, strictly under the control of the Central Government. Under GST, there is one tax for both goods and services, which is a clear tax policy and this will improvise collections of tax. It would also lead to a clear system and abolish tax based theft and corruption at the national level. GST being a friendly taxation system for the corporate sector will provide easiness in tax policies, reduce inflation levels, and make the overall system more transparent.

(3) Importance of the GST Taxation System - Trade, Government, and Consumer : GST will overcome various issues of development via greater interactions between VAT/GST systems along with overcoming the potential risks of double taxation and unintended non-taxation systems. GST will lay a strong foundation of collecting tax at early stage of value addition. Every business/tax payer would be a part of controlling and collecting the tax and remitting the proportion of tax corresponding to its margin. GST will thereby flow through the business to tax supplies made to the final consumer.

GST Reforms will play a crucial role for trade, government, and consumers in the following manner :

(i) Trade : In order to harmonize trade and bring significant reforms to boost up development, GST will act as a stepping stone for the following parameters: (a) multiplicity of taxes will be reduced, (b) tax neutrality, especially for exports goods, (c) development of one nation or one common economic market, (d) simpler tax with fewer rates and exemptions, (e) effectiveness in reducing cost for domestic industries.

(ii) The Government : GST promises a lot for transparent working system for the government in the following manner : (a) easy and simple taxation system - one common tax across the country, (b) tax base broadening, (c) great improvements towards collections of revenues, (d) resource utilization would be more effective, (e) investments out of savings by consumers - due to mitigation of cascading effect, which contributes to increase in availability of funds out of savings of consumer - which may be used for development.

(iii) The Consumer : For a normal Indian citizen, GST promises a lot in terms of better taxation system as follows: (a) reduction in the cost of goods and services due to significant elimination of cascading effect on taxes, (b) increase in household income and purchasing power , (c) increase in savings of common man, (d) high increase towards investment potential.

(4) Taxes Abolished and Items Exempted from GST : The Table 2 enlists the taxes to be subsumed in GST:

Table 2. List of Taxes Abolished After GST implementation

Government	List of Taxes
Central Government Taxes	Central Excise Duty
	Service Tax Additional Custom Duty Surcharges and all Cess
State Government Taxes	VAT/Sales Tax
	Entertainment Tax
	Entry tax not in lieu of Octroi
	Other taxes and Duties (Luxury Tax, Taxes on Lottery etc)
Taxes imposed by State Governments on Goods on Services	Stamp Duty Tax
	Vehicle Tax on Goods and Passengers Taxes and duties on Electricity

The following is the list of items exempted from Goods and Services Tax (GST): (a) all types of public services of the Government (Railways, Postal and Telegraphs, Public Sector Enterprises, Banks and Insurance, Health and Education services), (b) any service transactions between employer and employee either as service provider, receiver, or vice-versa, (c) education services provided by non-government schools and colleges, (d) health services provided by non-government agencies, (e) any unbranded food items.

(5) GST Council (GST Council, 2017) : In order to implement GST taxation effectively in India, the Constitutional (122nd Amendment Bill) was introduced and passed by Rajya Sabha on August 3, 2016 and by Lok Sabha on August 8, 2016. The GST council was framed officially on September 8, 2016 after clearance from the Honorable President of India.

As per Article 279A (1) of Amended Constitution, the GST Council was created by the President within 60 days of the commencement of Article 279A. The GST Council comprises of the following members : (a) Union Finance Minister- Chairperson, (b) The Union Minister of State, In - Charge Revenue of Finance - Member, (c) The Minister In-Charge or Taxation or any other minister nominated by each State Government - Members.

The GST Council was setup to perform the following duties : (a) taxes, surcharges, cess of Central and States which will be integrated in GST, (b) goods and services to be exempted from GST, (c) interstate commerce - IGST - distribution between State and Central governments, (d) registration threshold limit for GST, (e) GST floor rates, (f) calamities special rates, (g) provision with regard to special category rates, especially NorthEastern states.

(6) GST Models : Considering the importance of taxation reforms and other countries' based GST implementations, the following are the various GST models that are designed and proposed by experts for successful implementation of GST :

(i) The Kelkar - Shah Model
(ii) The Bagchi - Poddar Model
(iii) The Australian Model
(iv) The Canadian Model

(i) The Kelkar - Shah Model : It is based on "Grand Bargain" to merge various taxes like Central Excise, Service Tax, and VAT into one common tax. According to the model, GST can be implemented as per the following four stages :

Stage 1: Establishing information technology systems.

Stage 2: Building Central GST.

Stage 3: Political effort of agreeing on "Grand Bargain".

Stage 4: Interaction with States.

(ii) The Bagchi - Poddar Model : It is similar to the Kelkar - Shah Model, which envisions the combination of Central Excise, Service Tax, and VAT into one common umbrella of VAT. The difference between Kelkar-Shah and Bagchi-Poddar model is that Kelkar-Shah model proposes tax collection at Central and State levels, while the Bagchi-Poddar model stresses only on the Centre. The Kelkar - Shah model is like the Canadian Model, while the Bagchi - Poddar Model is like the Quebec model.

(iii) Australian Model : The Australian GST model is federal tax collected by the Central government and then distributed to the State government. But as India is a heterogeneous country, this model is not applicable in India.

(iv) Canadian Model : The GST in Canada is dual between the Centre and the States and has three varieties: (a) Federal GST and provincial retail sales taxes (PST) administered separately - followed by the largest majority, (b) Joint federal and provincial VATs administered federally (Harmonious Sales Tax - HST), (c) separate federal and provincial VAT administered provincially (QST) - only for Quebec as it is like a breakaway province.

(v) GST Models - Adopted by Foreign Countries : Among various countries which have adopted GST, France was the first country to adopt GST in the year 1960. The Table 3 enlists the GST models along with their applicability in different countries of the world.

Table 3. GST Models Implemented by Various Countries like Australia, China, USA, Brazil, Canada, and India

Name of the Model	Feature	Countries (Wherever Applicable)
National GST	Tax imposed by Central government with provision for sharing revenue with states.	Australia & China
State GST	Tax imposed by States	USA
Non-Concurrent Dual GST	GST on goods imposed by State & on services imposed by Central government.	Brazil, Canada, and India
Concurrent Dual GST	Tax imposed by Central and State governments on both Goods and Services.	
Quebec Model	Separate taxation system for tax collection, administration, and enforcements by provinces.	

Table 4. List of GST Rates Applicable in Various Countries

Name of Country	GST Rates (in %)
Netherlands	21%
United Kingdom	20%
France	20%
Germany	19%
India	0%, 5%, 12%, 18% and 28%
Russia	18%
China	17%
Pakistan	17%
Mexico	16%
New Zealand	15%
Australia, Brazil, Indonesia, Korea	10%
Japan, Switzerland	8%
Thailand, Singapore	7%
Malaysia	6%
Canada, Jersey	5%

Note : Ranking as per Descending Order . Source: Central Board of Excise and Customs (2017)

(7) Statistical Analysis and Comparison of Indian GST Rate with Other Foreign Nations : The Table 4 enlists the comparison of Indian GST rates with other economies of the world. In comparison with emerging market economies (EMEs), India has highest rate of GST @ 18% with major commodities falling under this rate of interest. Countries like China and Brazil have most of the commodities falling under 17% tax. Some of the developed economies like France, Germany, UK have GST @ 19 - 20%.

(8) Working of Goods and Services Tax (GST) : In order to understand how GST works, the detailed description is demonstrated in this section in lieu of manufacturer, distributor, and retailer along with the impact of cost of goods on final consumer.

(i) Manufacturer : In the previous taxation system, the manufacturer had to pass through two stages of taxation before transferring the benefit of products to the distributor. At the first instance, he had to charge excise duty @ 10% and then VAT @ 5 % , which means a total of 15% of indirect tax. If cost of product

was ' 100, then Excise duty was charged @ 10% on cost & VAT @ 5% on cost. The total cost of production became ' 115.

<div align="center">

Cost of Production   ' 100

+Excise Duty@ 10% ' 10

+VAT @ 5%   ' 5

Total Cost   '115

</div>

However, in GST, he has to deal with only one department and also, tax has been reduced by 5%, that is, he has to pay tax @ 10%. If cost of production is ' 100, GST @ 10% will be charged and the total cost of production will be ' 110.

<div align="center">

Cost of Production ' 100

GST@ 10 %   ' 10

Total Cost   ' **110**

</div>

It will give a benefit of ' 5 to the producer and this benefit will be passed to the distributor and ultimately to the consumer.

(ii) Distributor : In the previous tax regime, a distributor received goods at a cost of ' 115 from the manufacturer, he added 20% for his profit, VAT @ 5 %, and Service Tax @15% .The total cost that came out was ' 167 as illustrated below :

<div align="center">

Cost of Good Received: ' 115

+Profit   ' 23

+VAT @ 5%   ' 7

Service Tax@ 15%   ' 22

Total Price   ' **167**

</div>

In GST, a distributor will add only 20% profit margin & GST will be charged at 10% and the total price will come out to about ' 145 as illustrated below :

<div align="center">

Cost of Goods Received : ' 110

Profit Margin @ 20% : ' 22

GST @ 10%   : ' 13

Total Price   ' **145**

</div>

Thus, benefit of ' 22 (' 167 - ' 145) to the retailer in the new system. This benefit will be ultimately passed to the consumer.

(iii) Retailer : From the above explanation, it is clear that benefit of ' 22 is already received under the GST system. Now, if we study the retailer under the previous taxation system & GST, we will be clear about the total benefit received under the new tax regime. In the previous taxation system, the retailer received goods at a price of ' 167. Say, he will add 20% profit margin. VAT will be charged @ 10% and Service Tax @ 15%, then the total price to be charged from the consumer will come about ' 242.

<div align="center">

Cost of Goods Received : ' 167

Profit Margin @ 20% : ' 33

VAT @ 5%   : ' 10

Service Tax@ 15% : ' 32

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Total Price ＇242

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Under GST, the retailer is receiving goods at ＇145, after adding profit margin of 20% and GST @ 10%, the price charged will be only ＇191 as compared to ＇242 being charged under the previous taxation system.

<div align="center">

Cost of Goods Received: ＇145

Profit Margin @ 20% : ＇29

GST @ 10% ＇32

Total Price ＇191

</div>

It will give a benefit of ＇51 (＇242 - ＇191) to the consumer. Hence from the above examples, it is clear that not only the manufacturers, distributers, and retailers, but also the consumers will be benefitted under the GST Regime.

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Figure 2. A Working Example of GST Vs. Current Taxation System

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(1NR)	Current system	GST
Manufacturer		
Cost of goods	0	0
Add: Value addition	*10,000*	*10,000*
Basic price	10,000	10,000
Add: CEN VAT @ 12.5%	*1,250*	*0*
Add: GST @ 18%	*0*	*tsoo*
Total price	11,250	11,800
Wholsaler/distributor		
Cost of goods	11,250	11,800
Less: Input GST credit	*0*	*(1,800)*
Add: Value addition	*5,000*	*5,000*
Basic price	16.250	15,000
Add: VAT@ 12.5%	*2,031*	*0*
Add: GST @18%	*O*	*2,700*
Total price	18,281	17,700
Retailer		
Cost of goods	18,281	17,700
Less: Input VAT credit	*(2.031/*	*0*
Less: Input GST credit	*O*	*(2,700)*
Add: Value addition	*2000*	*2000*
Basic price	18,250	17,000
Add: VAT@ 12.5%	*2,281*	*0*
Add: GST @18%	*0*	*3060*
Total price paid by consumer	**20,531**	.20,060
Total value added in the	17,000	17,000
Total taxes paid	3531	3060
Effective tax rate (% of value addition)	**2.1**	< 16

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Source: ICICI Bank Research

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Reproduced from S. Tripathi, & N. Tripathi (2016, August 3). India : In a historic move, Rajya Sabha passes the GST Bill : Annexure (p.4). Retrieved from

(9) Live Demonstration of Tax Imposed via GST Taxation System in India : The Figure 2 demonstrates the working of GST. The example highlights that a manufacturer of a product requires raw material as inputs for the final product.

Impact of GST on the Indian Economy : Advantages and Challenges of GST Implementation

(1) Impact of GST on the Indian Economy : GST will impact the overall taxation system of the Indian economy. It will improvise the country's GDP ratio and also control inflation to a certain extent. However, the reform will mainly be advantageous to the manufacturing industry, but will make some things challenging for the service sector industry.

GST is expected to raise the GDP growth from 1% to 2%, but these figures can only be analyzed after successful implementation. Some countries have faced a mixed response in growth like New Zealand saw a higher GDP as compared to countries like China, Thailand, Australia, and Canada (Shokeen, Banwari, & Singh, 2017).

The GST rate is implemented in various slabs like 5%, 12%, 18%, and 28%, which will automatically provide great tax increments to the government and the manufacturing sector will face immense growth with reduction in tax rate. There is definitely something good for everyone. Various unorganized sectors which enjoy the cost advantage equal to tax rate which will be brought under GST. This will make various sectors like Hardware, Paint, Electronics etc. under the tax slab. GST requires everything to be planned meticulously for organized rate of taxation. There are still lots of sectors which are to be discussed under GST and this requires proper planning. For the common man and different companies, the collection of Central and State taxes will be done at point of time when sales originate, both components will be charged on manufacturing costs and price of the product will downgrade and consumption will thereby increase (Shokeen et al., 2017) .

(2) Impact of GST on Various Sectors : Goods and Services Tax (Taqvi, Srivastava, & Srivastava, 2013) will unite the Indian economy into one common market under a single umbrella of taxation rates, leading to easiness of starting and doing businesses, leading to increase in savings and cost reduction among various sectors. Some industries will be empowered by GST because of reduction in tax rates, while some will lose because of higher rate of GST interests (Panda & Patel, 2010).

In this section, we discuss various sectors and elaborate the impact of GST on them :

(i) IT Companies: GST will allow more implementation of digital systems and services. GST will increase the rate of tax from 14 -15% to 18%, which will increase the cost of electronic products like mobile phones, laptops, etc. (Adhana, 2015).

(ii) FMCG Industry : GST will have a significant impact on the FMCG sector. Some food items are exempted under GST like grains and cereals, milt, meat, fish, fruits and vegetables, candy etc. Before GST, FMCG companies paid 24-25% tax including Excise Duty etc. With GST, the rate of return would be 17-19% leading to strong impact in production and consumption (Jain, 2013).

(iii) Online Shopping : With the introduction of GST, various Ecommerce companies will face much burden of work in rate of filling taxes and cost will be increased.

(iv) Telecom Sector : With the current VAT charges of 15% being replaced by18% GST rate, the price of mobile calling, SMS, and broadband services would be impacted. This will have a negative impact for big telecom giants like Airtel, Vodafone, Idea, etc.

(v) Automobiles : GST will provide reduction on on-road price of vehicles to max by 8% as per the latest

report. Lower prices mean various automobile companies can boost up volumes and sales and have tremendous opportunities for expansion in India.

(vi) Small Scale Enterprises : There are three categories: (a) below threshold, need not register for GST, (b) between threshold and composition turnovers will have the option to pay a turnover based tax or opt to join the GST regime, (c) above threshold level, will be within the GST framework. Manufacturers and traders will pay less tax after GST Implementation.

(vii) Entertainment : With GST, taxes can do down by 2 - 4%, but the rate of tax for cinema lovers will be increased. GST will soon comprehend with demands and bring best for boosting up the film industry's business.

(3) Challenges of GST Implementation : The following are some of the major challenges for GST implementation in India (Poddar & Ahmad, 2009) :

(i) Nature of Taxes : In India, there are various taxes like Central Excise, VAT, CESS, and other state level taxes which will all be removed and come under one tax, that is, GST, but still lots of states and union territories have other taxes out from GST which has to be worked upon.

(ii) Types of GST : As GST would be of two types : Central GST and State GST and further division is required on the basis of utmost necessity and property based like need, location, geography, and resources which has to be worked upon.

(iii) Rates of Tax : Still the tax rate is not fully finalized and lots more has to be worked upon considering the standard of living of people, etc.

(iv) Tax Management and Technology Infrastructure : It is utmost necessary that proper management of tax and infrastructure is required to implement proper policies and plans.

Conclusion

Primarily, the concept of GST was introduced and proposed in India a few years back, but implementation has been done by the current BJP government under the able leadership of Prime Minister Shri Narendra Modi on July 1, 2017. The new government was in strong favor for the implementation of GST in India by seeing many positive implications as discussed above in the paper. All sectors in India - manufacturing, service, telecom, automobile and small SMEs will bear the impact of GST. One of the biggest taxation reform- GST will bind the entire nation under a single taxation system rate. As forecasted by experts, GST will improvise tax collections and boost up India's economic development and break all tax barriers between Central and State Governments. No doubt, GST will give India a clear and transparent taxation system, but it is also surrounded by various challenges as discussed in this paper. There is need for more analytical based research for successful implementation.

Limitations of the Study and Scope for Future Research

The following are the limitations of the study: (a) GST is still in maturity phase, so tax reforms can occur from time to time via GST council meetings regarding finalization of tax rates and even imposition of new rates and even deduction of existing rates, (b) most of the data cited in the paper was speculatively exploratory in nature as GST meetings are going and still, a lot more needs to be done, (c) final conclusions may vary considering different perceptions.

After GST implementation, there is emergent requirement of modern technology-based infrastructure like GSTNET for successful monitoring of taxation system as well as the GST Council should regularly conduct meetings for change in tax reflections. These areas can be covered by researchers in future studies.

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