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POTENTIAL OF MEDICINAL HERB: *TAGETES ERECTUS*

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Abstract:

The study is aimed to provide rationalization to the Traditional claims of the *Tagetes erectus* leaf by phytochemical assessment and to investigate the active principle present in *Tagetus erectus (compositae)* commonly known as *Marigold* is an important plant which used to treat various diseases like Epilepsy, wound healing, anti-inflammatory, anemia, etc. in indigenous system of medicine. Literature survey of the plant, *Tagetes erectus* revealed that the standardization, phytochemical study, and microscopic evaluation of the leaf part was not explored in depth, thus it was thought worthwhile to take up the work for its proper authentication and identification of the plant. Thus the present work embodies the investigations carried out to establish methods for quality control of drug, complete botanical evalution which comprises macroscopic, microscopic, physicochemical parameters like Ash value, Loss on drying, Extractive value to determine the active phytoconstutuents present in the extract. Thin Layer Chromatography, Total Phenolic Contents were also carried out for the investigation of active constituents and quality control of the drug.

Key words: *Tagetes erectus*, *Marigold*, Thin layer chromatography, Potential

Introduction:

Herbal medicines originated from the ancient use of wild plants. Today, with the possibility of carefully controlling the cultivation of medicinal plants and even improving them genetically, it is possible to develop and market a wide variety and quality of herbal drugs of consistent chemical composition and excellent quality to treat various diseases. One of the important constituent of *Tagetes erectus* may possess that quality.[1]

Tagetes erectus belong to the family *Compositae*. It is a small shrub; the plant grows upto a height of 1-3 feet and spreads about 0.5-1 feet. The leaf is arranged in opposite to subopposite with pinnately compound leaf. Margin is denate with oblong in shape bears green in colour with a blade length less than 2 inch. The leaves are 4 to 11cm long and very deeply pinnatifid, with the lobes lanceolate, coarsely and sharply toothed, and 1 to 2.5cm long , the flowers are pale to deep yellow.[2]

The leaves are used in kidney troubles and in muscular pains and are applied on boils and carbuncle. In Unani medicine, a

confection of tender leaves and purified sugar is prescribed in anuria, retention of urine and kidney troubles [2]. The flowers contain pigments as Quercetagetin and quercetagetrin. Phytochemical investigation of leaf shows presence of Flavonoids, glycosides, phenols, tannins, and steroids.

Material and methods:

Plant material:

The leaves of *Tagetes erectus* were collected from the wild sources of Shirpur forest, and it was identified and authenticated by Dr. Sagar Kshirsagar, Dept. of Botany, SSVPS, College of science, Dhulia. A voucher specimen is placed in the Dept. of Pharmacognosy for further reference. The collected plants were washed, dried and were pulverized with the help of mechanical grinder and was passed through sieve no 40, and stored in closed vessels for future use. The fresh leaves were used for Microscopy Identification.

Pharmacognostic Studies:

Morphological Studies were carried out by using simple determination technique, the shape, size, color, odour, margin and apex. Apex of the leaf .Microscopic Studies were carried out by preparing of thin hand section of leaf. The sections were cleared with alcohol and stained as per the Protocol. Histochemical reaction were applied with Concentrated Hydrochloric Acid and Phloroglucinol and were mounted in Glycerin for identification of Lignified Elements, Iodine Solution for Identification of Starch Grains, 60% Sulphuric Acid for Calcium Oxalate Crystals in the powdered leaf by reported methods [3,4].

Physico chemical parameters:

The parameter was done to evaluate the percentage of total ash, water soluble acid insoluble ash were calculated as per Indian Pharmacopoeia[3]. The extract of the powdered leaves were prepared with the different solvents for the study of extractive value. Fluorescence analysis was also carried out for the powder as well as different extracts.

Powder analysis:

Preliminary analysis of the powder of leaf of Tagetes erectus were carried out with different chemical reagents[5, 6].

Preliminary phytochemical analysis:

For the Preliminary phytochemical analysis, the extract was prepared by weighing 100gm of dried powdered leaf and were subjected to maceration with different solvants as per the Polarity, Ethanol, Hydro-alcoholic, and finally with Aqueous. The extracts were filtered in each step, concentrated, and the solvent was removed by rotary evaporator. The extracts were dried over desiccator and the residues were weighed. The presence and absence of the primary and secondary phytoconstituents was detected by usual prescribed methods. [5, 7]

Result and Discussion:

Macroscopic Characters of Leaf:

The transverse section of the leaf showed following characters. The leaf is generally dorsiventral in nature and it consisted of two major regions namely the Lamina region and Midrib. The lamina region consisting of upper and lower epidermis, spongy mesophyll region, which consisting of palisade cells and few crystals of calcium oxalate. The midrib region consisted by

xylem and phloem. At the lower portion collenchyma cells which were completely arranged, above that loosely packed parenchyma cells were observed.

Powder Microcopy:

The green colored powder was used for the study. The powder was stained with phloroglucinol and concentrated hydrochloric acid. It was mounted in glycerin and examined under 10 X and then magnified with 40 X. On microscopical examination it showed prism shaped calcium oxalate crystals. Trichomes were unicellular and uniseriate covring, vessels were spiral in nature, starch grains were spherical in nature, and fibres were long, slender and non-lignified in nature.

Fluorescence Analysis:

The powder drug and extracts were subjected to fluorescence analysis as per the standard procedure.

Physicochemical Parameters:

The powdered drug was evaluated for its physic-chemical parameters like Ash values: Acid Insoluble ash, water soluble ash, water insoluble ash, extractive values (Alcohol and water soluble values) and loss on drying.

Preliminary Phytochemical Analysis:

The Alcoholic and Aqueous extract was subjected to preliminary phytochemical analysis for their presence of the constituents. It showed the presence of Flavonoids, tannins, phenols and glycosides.

Conclusion:

Now a days the standardization of crude drugs has very important for identification and authentication of crude drug, but due to certain obstructs the importance was not up to the mark.

Hence, lack of Standardization technique fails to identify the dug from its originality which there by exploits the usage of drug from its Traditional System of medicine. The plant *Tagetes erectus* is used widely for curing various diseases and gives a helping hand to the Humans. Thus a perfect protocol was designed for its Authentication and identification on the basis of Microscopy and chemical analysis. Thus the present investigation was aimed and the results were found to be significant and encouraging towards the goal for Standardization.

Acknowledgement:

Authors are grateful to Dr. Sagar Kshirsagar, Botanist, SSVPS Science College, Dept.of Botany, Dhule (MS), India for the identification and Authentication of the plant material.

References:

1. The Wealth of India, C.S. I. R. publications, New Delhi, 2005; 109
2. Khare. C. P. Encyclopedia of Indian Medicinal Plants, Springer-Verlag Berlin Heidelberg, New York, 2004; 441.
3. Kokate C., Purohit A and Gokhale S: Practical Pharmacognocy. Vallabh Prakashan, New Delhi, Edition 10, 1994: 112-120.
4. Trease GE and Evans WC: Pharmacognocy. Saunders Copant Limited, New Delhi, Edition 15, 1996, 516-547.

5. Indian Pharmacopoeia, Controller of Publications, New Delhi, Vol 2 , 1995, A-54.

6. Pratt PR and Chase ER: Fluorescence powder vegetable drugs in particular to development systems of identification. Journal of American Pharmaceutical Association 1949; 38: 324-331.

7. Harbone JB. Phytochemical Methods-A guide to modern Techniques of Plant Analysis , Chapman and Hall, London, 1998; 42:129, 189, 203.

Table 1 – Fluorescence analysis of powder and extract

Sr.No	Drug	Visible(400nm)	ShortUV(256nm)	LongUV(365nm)
1	Powder	Green	Dark Green	Black
2	Powder + Water	Green	Dark Green	Black
3	Powder + Conc.HCL	Dark green	Blackish green	Black
4	Powder + Conc.H_2SO_4	Dark brown	Blackish green	Black
5	Powder + Conc.HNO_3	Light brown	Green	Black
6	Powder + NaOH	Brown	Dark Green	Black
7	Powder + Acetone	Green	Dark Green	Black
8	Powder +Methanol	Green	Dark Green	Black

Table 2 – Results of Physicochemical Parameters

Sr. No	Standardization Parameters	Results
1	Total Ash	18% w/w
2	Acid Insoluble Ash	6.5% w/v
3	Acid Soluble Ash	11.5% w/v
4	Water Insoluble Ash	15.5% w/v
5	Water Soluble Ash	2.5% w/v
6	Water soluble Extractive value	8.2% w/v
7	Alcohol soluble Extractive value	11.2% w/v
8	Loss on drying	9.33% w/w

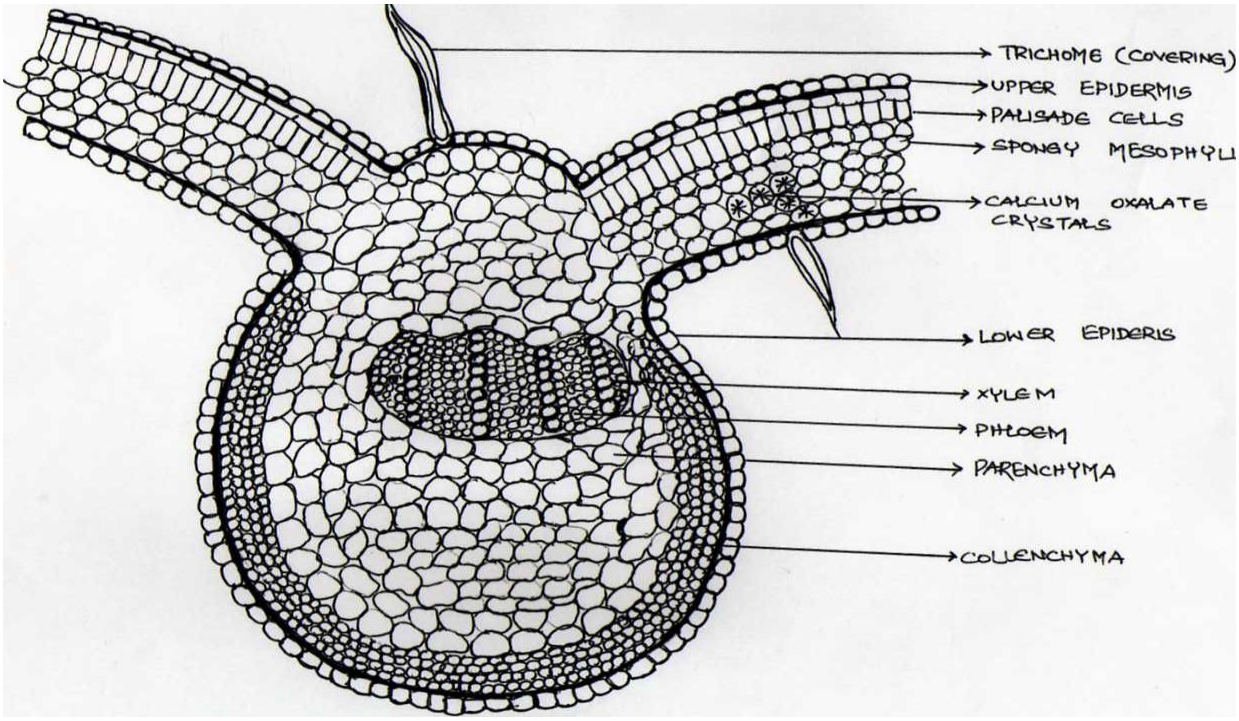

Figure 1 – Transverse section of leaf of *Tagetes erectus*

Fibre **Vessels** **Cal. Oxa. Crystal** **Starch grain** **Trichome**

Figure 2 – Powder characteristics of *Tagetes erectus* leaf

COMMUNICATION STRATAGEM AND ITS IMPORTANCE IN HEALTH CARE SECTOR: A STUDY

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Abstract:

This study reflects the importance of the communication strategy in Healthcare sector. The business of pharmaceutical industry is totally dependent upon the communication strategy opted by the sales people in marketing. Healthy communication between a Medical representative and the Health professional (doctor/ nurse/ pharmacist) helps to build a strong foundation for the business growth. Besides that, some secondary factors also which play a significant role to lead the product demand in sight of doctor. Thus, a question arises do the "trained" sales representative are enough to carry on the running horse of an organization? What are the factors which a doctor think should be fulfilled by the Medical representative?

Introduction:

Medical representatives (MRs) are the input bond between pharmaceutical companies and health professionals. There work involves the awareness and use of company's medical product. The hierarchy level is as follows:

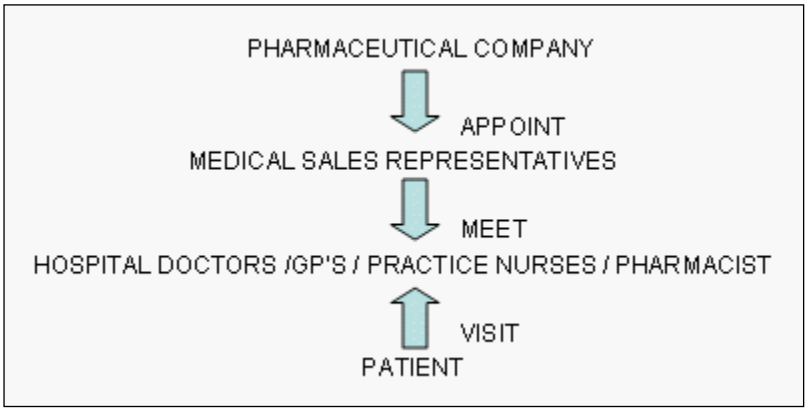

Figure: 1 Hierarchy of pharmaceutical product information flow

"Getting trained in a closed room, and reaching the sales target outside that closed system" is totally an opposite state of affairs. Candidates, who generate innovative way of approaching the sales opportunities, actually win the race. There is no strict blueprint to immediately hike the demand of the product in the market, but a hit and trial rule sometimes works here. The better you hit the target, the healthier you represent your product in front of doctor,

and the positive the chances are of prescribing that product by the doctor.
An experienced representative knows the work pattern, territory, and potential clients from where he/she can grab the prospective business. But, the key to success behind the whole process is the "communication" between the sales people and the health professionals.

Objective of the study:

- To emphasize on the importance of communication in the healthcare sector.

Research Methodology:

- An interview was taken to extract data from doctors of the govt. hospitals.
- The Sample size used for the study was 30 doctors of 10 Govt. hospitals central Delhi, New Delhi.
- The parameters used for study were : communication practice, pronunciation, voice modulation, consistency and number of meetings done by MR.

Analysis:

The statistics in relation to the analysis done in context with govt. hospitals of New Delhi:-

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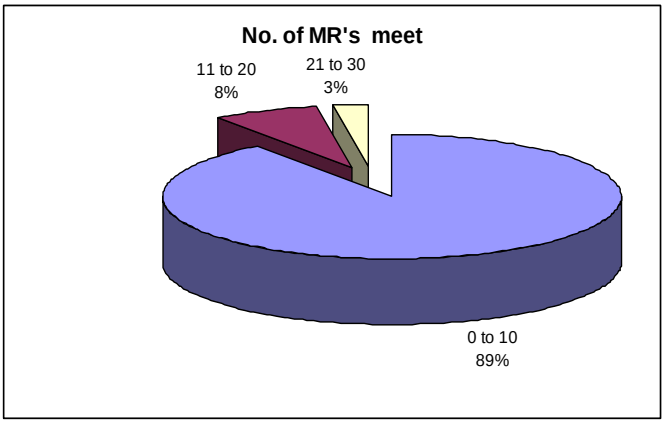

Figure: 2 Number of MRs meets on a daily basis with the doctor

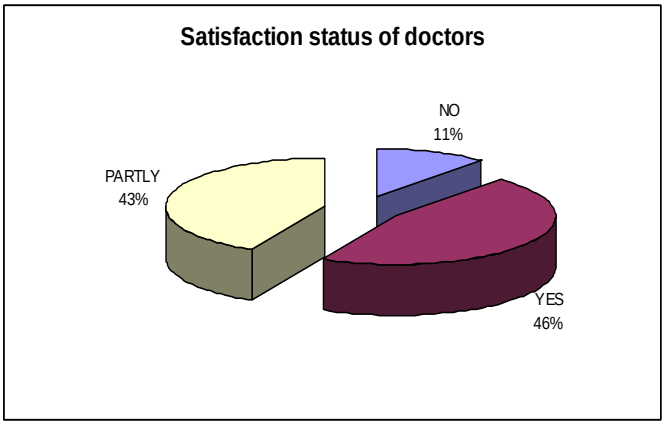

Figure:3 Satisfaction status of Doctors by the communication practice implemented by MRs.

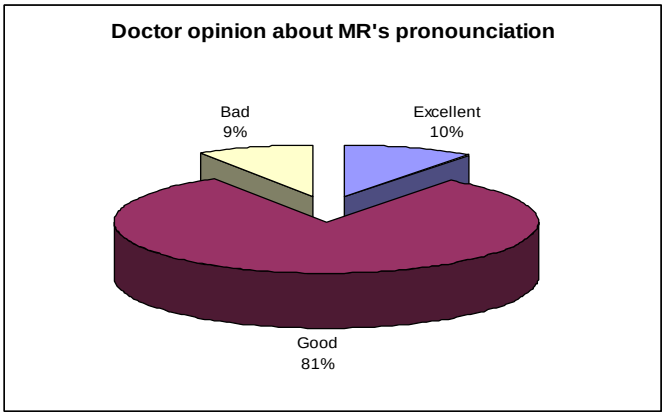

Figure:4 Doctor's opinion about pronunciation of the product name (generic name especially) by MRs.

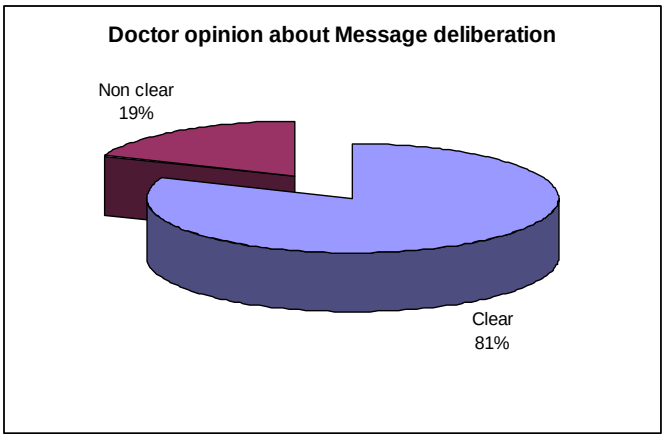

Figure: 5 Doctor's opinion about Message deliberation of MRs.

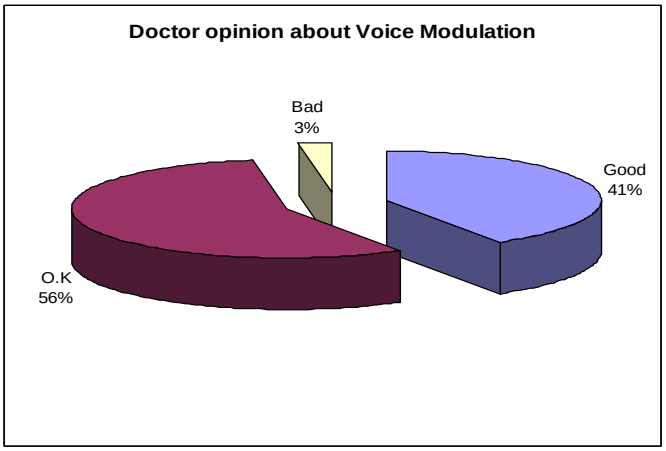

Figure: 6 Doctor's opinion about voice modulation of MRs

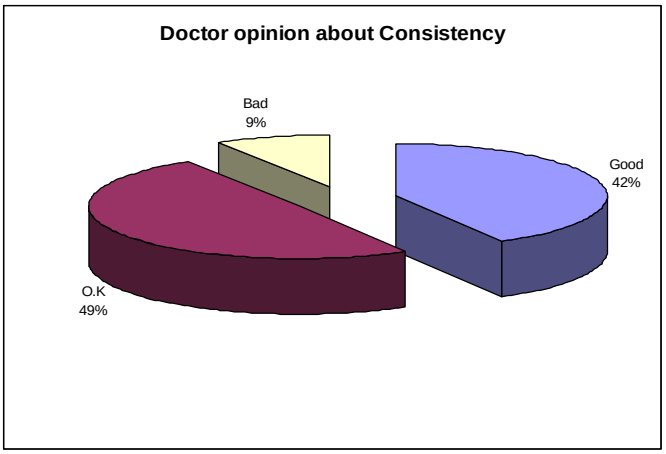

Figure: 7 Doctor's opinion about the consistency of voice of MRs.

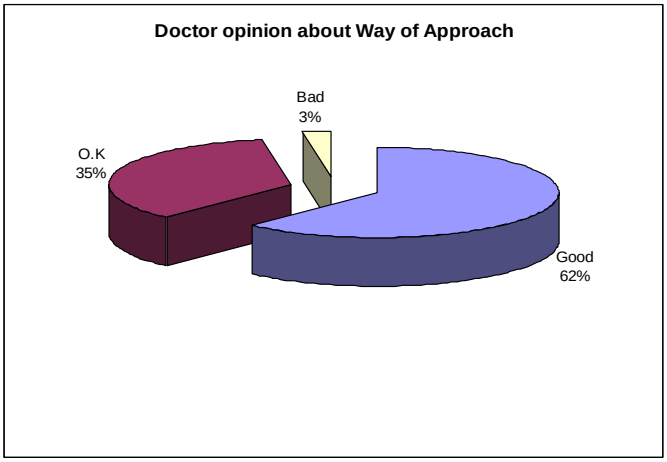

Figure: 8 Doctor's opinion about the way of approach of MRs.

Therefore on the basis of the above figures, there are some suggestions listed below to overcome this ambiguity.

Suggestions: How MRs should communicate?

- Differentiate between formal and informal communication.
- Categorize the nature of health professional before communicating with them.
- An "appealing personality" with "good command on language", is half of the work done.
- Voice clarity and confidence is essential while detailing a product.
- Body language speaks before the mouth speaks.
- Understand the gestures of the professionals in response to your detailing.
- "Survival of the fittest", at last the success will be with the one who make continuous efforts in competition.

(Source: flickr-fro3enfire) photographer: Amit kasuhal

Figure: 9 "Survival of the fittest"

Conclusion:

The graphs & figures mentioned here are reflecting the void faced by MRs in relation to communication in healthcare industry. It is a subject of concern that the formal and informal communication, both plays an important role right from the beginning till the end of the business flow. "Right approach at the Right time" is the hymn which leads to success. Pharmaceutical companies also, should contribute to overcome this loophole of "weak communication" during their training sessions of Medical Representatives.

References:

1. The Indian Medical Council Act 1956.Universal Law publishing Co. Pvt. Ltd. 2003, accessed on 26th March 2010.
2. Medical sales representative: A Description,www.prospects.ac.uk/links/MedExec/ accessed on 9th April 2010.
3. Unethical relationship between authors and drug companies, accessed on 20th April 2010.
4. Marketing communications in the Pharmaceutical Industry by Peter Holden accessed on 1st May 2010.

AN EPIDEMIOLOGICAL STUDY ON ROAD TRAFFIC ACCIDENTS REPORTING IN CASUALTY OF RURAL TEACHING INSTITUTE OF A DISTRICT IN MAHARASHTRA STATE OF INDIA

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Abstract:

Introduction: Road Traffic Accidents (RTA) in developing countries is now becoming a burden on health system and society itself. World Road Statistics estimates India to have the second highest number of road accidents in a year. RTAs are mainly due to carelessness, addiction, overconfidence and changing life styles.

Objectives: To study the epidemiological factors for causation of RTAs and To determine the distribution of RTAs with respect to time, type & site of accident.

Study design: Cross sectional hospital based study

Participants: 232 RTA cases reported to emergency room during six months from January to June 2009 was undertaken

Main outcome measures: These are percentage of males involved, reason & types for accidents, drivers influence of alcohol, without license & protective equipments, number of disabilities.

Result: 60-80% of total cases were males and in the age group of 20-40 years. 61.3% cases were due to vehicle to vehicle type of accidents, which mostly occurred at night and due to high vehicular speed mainly at night, due to high speed on highways. 44.7% had minor injuries, 23.4% had fractures whereas 12.8% had multiple injuries. 9.2% were transferred to another hospital for treatment. 61.7% of all RTAs cases were treated, cured & discharged. 23.5% had disability at the time of discharge. Unfortunately 5.60% could not survive.

Conclusion: There is definite need of road safety education, enforcement of traffic safety regulations and strengthening of health care facilities with more emphasis on trauma care units to prevent RTAs in near future.

Keywords: Accidents, road safety, traffic regulations, injuries, RTAs

Introduction

Road Traffic Accidents (RTA) in developing countries is now becoming a burden on health system and society itself. RTAs are mainly due to carelessness, speeding, poor traffic sense, overtaking, overcrowding, addiction, overconfidence and changing life styles.

A World Health Organization report estimates that road traffic accidents caused 1,180,000 deaths worldwide & the global cost of road traffic accidents to be $518 billion per year in 2002. [1] India has one of the highest road accident rates in the world. There has been a steady rise in the deaths due to road accidents in the country, with an increasing proportion to the total death in the country. In India, nearly 80,000 die and 340,000 injured every year in about 300,000 accidents on road network of just 22,00,000 Km. and there is an accident occurring once in every one minutes & death every 8 minutes [2]. Currently motor vehicle rank 9th in the order of disease burden and projected to be ranked third in year 2020.World Road Statistics (2007) s estimated that in the year 2005, India had the second highest number of road accidents.

Families can be pushed into poverty by the loss of earnings of a family member killed or injured in a road accident. Beside the loss of earnings, the families struggle to meet the immediate financial needs that arise for providing medical care for funeral costs.

Human vehicle and environmental factors play roles before, during and after a trauma event. Accidents therefore can be studied in terms of agent, host and environmental factors and epidemiologically classified into time place and person distribution. Keeping in mind all these factors, the study was conducted at Acharya Vinoba Bhave Rural Hospital Sawangi (Meghe) Wardha, in the state of Maharashtra, (India) with the objective of studying the epidemiological factors for causation of RTAs & determine the distribution pattern with respect to time, type & site of accident.

2. Methodology

Type of Study: A Cross sectional hospital based study.

Study period: January to June 2009.

Study sample: All cases of RTAs reporting to the emergency room of Acharya Vinoba Bhave Rural Hospital & Jawaharlal Nehru Medical College Sawangi (Meghe) Wardha. During the six month period, 201 cases of Road Traffic Accident were reported. A total 232 RTA victims Information was collected through interviewing the victim or their attendant and substantiating the

additional information through the Medico-Legal Records.

Study variables: Age sex education & occupation of victims. Time, place person and the type of vehicle involved in the accident.
For the purpose of the study, a Road Traffic Accident (RTA) was defined as accident on the road between two or more objects, one of which must be any kind of a moving vehicle. Any injury on the road without involvement of a vehicle or injury involving a stationary vehicle was excluded from the study.

The victims of the accidents were interviewed to obtain the information about the circumstances leading to accident. A pre-tested questionnaire specially designed for this purpose was used for interviewing the accident victims, either in the emergency room or in the wards of Hospital as per the convenience of the patients & relatives. In cases, where the condition of the victims did not warrant the interview, the relatives or attendants were interviewed.
The medico-legal records and case sheets of the victims were referred for collecting additional information and for substantiating the information provided by the patient /attendant.

Data was collected on daily basis which was compiled, tabulated and analyzed.

Results

Total no of MLC's in six months were 311cases out of which total no of Road Traffic Accidents are 201(64.63% of total MLCs) involving 232 victims including 13(5.60%) deaths.

Out of 232 victims, 142 (61.2%) were drivers, among those 18 (12.67%) were under the influence of alcohol. Surprisingly only 7 (4.92%) drivers were wearing the helmets/seat-belts.

Among all victims, laborer were (27.59 %), employee in service (24.57 %) and students (16.38 %) were found involved more in RTAs. (Table 1)

Percentage of males involved in RTAs was 81.03 % with 74.51% of victims were in the age group 21-40 yrs. (Table 2)

61.3% of accidents were vehicle to vehicle type and accidents were took place mainly during night (60.7%) and on highways (43.78%) because of high speed of the vehicle.

Among all vehicle to vehicle type accidents, 25.87% were two wheelers followed by four wheelers & Truck i.e. 20.90% each. Bullock cart and Bicycle were found involved in 5.47% & 4.98%. (Figure I)

44.72% had minor injuries, 23.4% had fractures whereas 12.8% had multiple injuries. Upper and lower extremities found involved more among all the type of injuries. (Table 3)

9.2% were transferred to another hospital for treatment. 61.7% of all RTAs cases were treated, cured & discharged. However 23.5% are living with some disability.

Discussion

Life styles are changing not only in urban area but also in rural area. The number of vehicles is increasing in rural area tremendously. In rural areas, people generally do not adhere to the traffic rules and discipline. The present study was carried out in the emergency room of a teaching institute & hospital located in a rural area whose catchment area is mainly from villages and a national highway.

There are total 311 medicolegal cases reported to casualty during a study period and out which 201 (64.63%) were RTA cases involving 232 victims. Majority of the RTA victims were between the age group of 21 to 40 years. Similar finding were also reported in a study of Tanzania by ***Moshiro C & et al*** (2005). [3] The victims were mainly from the age group of 21-40 years. The age group of the drivers was between 21-40 years. Those above 40 years are generally more careful in driving, as well would have gained more driving skills over the years.

Males were found to be involved more than females in RTAs, the similar findings were reported by many studies, ***Kumar A et al*** (1999)[4] and ***Singh R et al*** (2003) [5] this is because of their mobility & nature of outdoor works than females.

It was also observed that majority of the victims were educated, and employed who have to travel either for studies or work. The victims were either Laborers (27.59 %), employed in service (24.57 %) or students (16.38 %).

It was found that 16(11.26 %) drivers of vehicles did not have a valid driving license, which reflects poor enforcement of the traffic rules by the Traffic police Department.

61.3% of accidents are vehicle to vehicle type, of which 25.87% were two wheelers. Two wheelers are mostly driven by young students who are generally inexperienced drivers with a tendency to drive at an uncontrollable speed.

60.7% of the accidents took place at night, and 43.78% on highways especially on weekends. Most people move from their homes to holiday destination on weekends.

Protective equipment was used by only 4.92% of the drivers whereas a study in Thailand by ***Thanaboriboon Y*** (2006)[6] found that only 10% of the drivers were using helmets & seat belts. This low percentage of use of protective equipment reflects poor law enforcement by the Road Traffic department, as well as a casual attitude towards life and law. According to one such study it was also seen that in most of the gulf countries the seat belt law is ignored because of which there is high prevalence of deaths among the road traffic accidents. [7]

The percentage of drivers who were found to have consumed alcohol is 12.67%, Similar findings were also reported by ***Jha & et al*** in 2003. [8] where they found that 14.9% drivers were under influence of alcohol. Impaired driving ability due to consumption of alcohol is documented by many studies in India & outside. The risk of accidents is higher in those whose blood alcohol levels are higher.

44.72% had minor injuries, 23.4% had fractures whereas 12.8% had multiple injuries. Upper and lower extremities were most affected among all the type of injuries. 9.2% were transferred to another hospital for treatment. 61.7% of all RTAs cases were treated, cured & discharged whereas 23.5% are still living with some disability. Unfortunately 13(5.60%) could not survived.

Conclusion

There is definite need of road safety education, enforcement of traffic safety regulations and strengthening of health care facilities with more emphasis on trauma care units to prevent RTAs in near future.

Recommendations

- Safety measures like use of Helmets, leather cloths & boots, proper door locking and safety belts should be used by everyone to prevent injuries.
- Driving on highways with a very high speed should be avoided specially during night hours.
- Awareness regarding traffic rules should be necessary for all who drives on roads

References

1. Peden M: Global collaboration on road traffic injury prevention. International J on Injury control safety promotion, 2005, 12(2) : 85-91
2. Supriya satish Patil, RV Kakde, PM Durgawale and SV Kakde; Pattern of Road traffic Injuries: A study from Western Maharashtra, Indian Journal of Community Medicine, 2008 January;33(1): 56-57
3. Moshiro C, Heuch I, Astrom AN, Setel P, Hamed Y, Kyle G. Injury mobility in an urban and rural area in Tanzania:an epidemiological survey: BMC Public Health, 2005;5:11
4. Kumar A, Qureshi GU, Aggarwal A and Pandey DR. Profile of thorasic injuries with special reference to road traffic accidents in Agra, Journal of Indian Association of Forensic Medicine,1999;21(4):104-109
5. Singh R, Sharma CS, Mittal R, Sharma A.Traumatic spinal cord injuries in Haryana: An epidemiological study; Indian Journal of Community Medicine,2003;28(4):184-6
6. Thanaboriboon Y. Risk factors of road traffic accidents; Health setuation in Thialand, 2006; 2(10):1-6

7. Bener A, Abu-Zidan FM, Bensiali AK, Al-Mulla AAK, Jadaan KS. Strategy to improve road safety in developing countries, Saudi Medical Journal; 2003; 24:603-608
8. Jha N, Srinivasa DK, Roy G and Jagdish S. Injury pattern among road traffic accident cases: A study from South India;Indian Journal of Community Medicine; 2003;28(2):85-90

Table 1: Distribution of the patients of RTAs according to epidemiological factors

Epidemiological Factors		No. of patients	Percentage
Gender	Male	188	81.03
	Female	44	18.97
Educational Status	Illiterate	38	16.38
	Primary	43	18.53
	Secondary	38	16.38
	Higher secondary	42	18.10
	Graduate & above	66	28.46
	Not applicable (< 5 yrs)	05	02.15
Occupation	Laborer	64	27.59
	Agriculturist	25	10.77
	Students	38	16.38
	Employee in service	57	24.57
	House wife	21	09.05
	Un-employed	14	06.03
	Retired	08	03.46
	Not applicable (<5yrs)	05	02.15
Type of accident*	Vehicle to vehicle	123	61.3
	Man to vehicle	38	18.9
	Turn-over of vehicle	24	11.9
	Others	16	07.9
Time of accidents*	Day (6 AM-6PM)	79	39.3
	Night (6 PM- 6 AM)	122	60.7
Site/ place of Accident*	Highways	88	43.78
	Roads other than highway	65	32.34
	Small lane	25	12.43
	Other places	15	07.46
	Unknown	08	03.99

* No of accidents are 201whereas victims are 232

Table 2: Age & Sex-wise distribution of Victims of RTAs

Age	Male N=188	Percentage	Female N=44	Percentage
0-10	5	2.65	2	4.55
11-20	20	10.51	7	15.9
21-30	113	60.11	21	47.74
31-40	32	17.02	7	15.9
41-50	8	4.4	5	11.36
51 & above	10	5.31	2	4.55
Total	188	100	44	100

Table 3: Distribution of injuries according to the different parts of the body

Site *	**Abrasions**	**Laceration**	**Multiple injuries**	**Fractures**	**Crush injuries**
Head, neck, face	51 (25.7)	36 (33.6)	21 (37.5)	01 (02.3)	06 (15.4)
Chest & thorax	11 (05.5)	06 (05.6)	02 (03.6)	00 (00.0)	00 (0.00)
Abdomen	05 (02.5)	07 (06.6)	02 (03.6)	00 (00.0)	00 (00.0)
Pelvis	04 (02.2)	03 (02.8)	00 (00.0)	04 (09.1)	00 (00.0)
Extremities	122 (61.6)	49 (45.8)	31 (55.3)	39 (88.6)	33 (84.6)
Back	05 (02.5)	06 (05.6)	00 (00.0)	00 (00.0)	00 (00.0)
Total	198 (100)	107 (100)	56 (100)	44 (100)	39 (100)

*** Multiple responses**

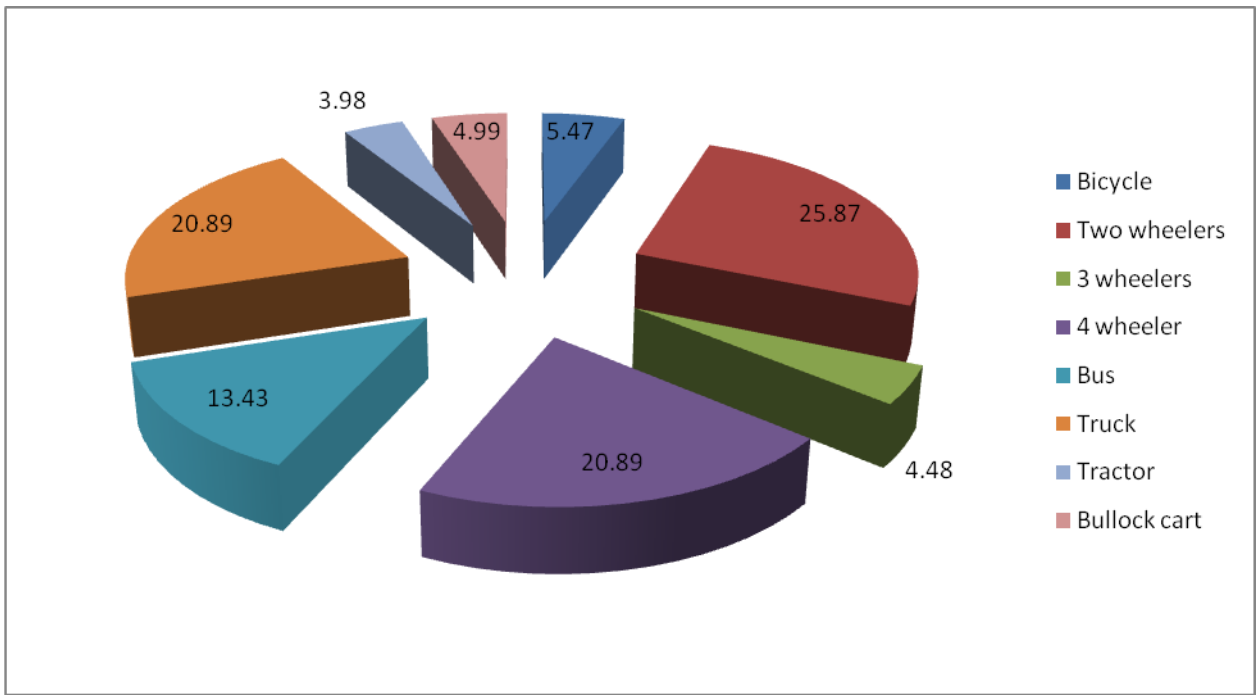

Figure : Percentage of type of Vehicle involved in Road Traffic Accidents.

PELLETS: A GENERAL OVERVIEW

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Abstract:

Traditionally, the word "Pellet" has been used to describe a variety of systematically produced, geometrically defined agglomerates obtained from diverse starting materials utilizing different processing conditions. Pellets range in size, typically, between 0.5 – 1.5 mm, though other sizes could be prepared. Pellets are for pharmaceutical purposes and are produced primarily for the purpose of oral controlled-release dosage forms having gastro resistant or sustained-release properties or the capability of site-specific drug delivery. For such purposes, coated pellets are administered in the form of hard gelatin capsules or disintegrating tablets that quickly liberate their contents of pellets in the stomach. As drug-delivery systems become more sophisticated, the role of pellets in the design and development of dosage forms is increasing. Formulation of drugs in multiple-unit dosage forms, such as coated pellets filled in capsules or compressed into tablets, offers flexibility as to target-release properties. The safety and efficacy of the formulation is higher than that of other dosage forms.

Keywords: pellets, coating, pelletization process, controlled release pellets

Introduction

Pellets provide the development scientist with a high degree of flexibility during the design and development of oral dosage forms. They can be divided into desired dose strengths without formulation or process changes, and can also be blended to deliver incompatible bioactive agents simultaneously or particles with different release profiles at the same site or at different sites within the gastrointestinal tract.

Pelletization is an agglomeration process that converts fine powders or granules of bulk drugs and excipients into small, free flowing, spherical or semi spherical units, referred to as pellets [1]. In addition, pellets have numerous therapeutic advantages over traditional single units, such as tablets and powder-filled capsules. Taken orally, pellets generally disperse freely in the gastrointes-tinal tract, and consequently maximize the drug absorption, minimize local irritation of the mucosa by certain irritant drugs because of the small quantity of drug available in a single pellet, and reduce inter- and intrapatient variability [2].

As the advantages of pellets over single units became clear, the pharmaceutical industry as a whole started to devote

resources to conduct research in pellet technology and, whenever possible, acquire advanced equipment suitable for the manufacture of pellets.

Pellets may be manufactured by using different methods according to the application and the choice of producer. The methods used for Pelletization are essentially the same as the granulation methods. The most widely used processes are extrusion and spheronization and solution or suspension layering, and powder layering. Other processes with limited application in the development of pharmaceutical palletized products include globulation, balling, and compression.

Advantages of pellets:

- They can be divided in to desired dosage strength without process or formulation changes.
- When pellets containing the active ingredient are in the form of suspension, capsules, or disintegrating tablets, they offer significant therapeutic advantages over single unit dosage forms [3-5].
- They can also be blended to deliver incompatible bioactive agents.
- They can also be used to provide different release profile at the same or different sites in the gastrointestinal tract.
- Pellets offer high degree of flexibility (figure 1) in the design and development of oral dosage form like suspension, sachet, tablet and capsule [6 -8].
- Pellets disperse freely in GI tract, maximize drug absorption, and minimize local irritation of the mucosa by certain irritant drugs.
- ***Improved flow characteristics:*** Spheres have excellent flow properties which can be used in automated processes or in processes where exact dosing is required, e.g. tabletting, moulding operations, capsule filling, and packaging.
- ***Coating:*** Coating of granules is often applied for stabilizing active ingredients in the granule or to control the release of these active ingredients. Typical applications in the pharmaceutical industry are the controlled release medicines. The easiest shape to coat is the sphere due to the absence of edges. It is also the most economical one to coat as no extra coating material is required to fill irregularities in the surface of the granules [9-11].
- ***Packing of beds and columns*** [12]***:*** In certain processes, porous beds or columns are used as chemical reactors. Spherical particles allow the reproduction of beds with always the same void volume, surface area and permeability. Calculations and predictions of the process characteristics also become easier when round particles are used as many equations are based on flows around symmetrical bodies.
- ***Density increase:*** Both the true and the bulk density of granules are increased by spheronising. This can

improve the process and the packaging.

- ***Marketing:*** For consumer products, spheronising is sometimes only applied for improved product appearance and marketing reasons.
- ***Hardness and friability:*** Hardness and friability depend on the internal cohesive forces and surface characteristics. Spheronization increases the hardness and reduces the friability of granules. This will reduce the amount of fines generated during handling or transportation.

Disadvantages of pellets [13]:

- Dosing by volume rather than number and splitting into single dose units as required.
- Involves capsule filling which can increase the costs or tabletting which destroy film coatings on the pellets.
- The size of pellets varies from formulation to formulation but usually lies between 1 to 2mm.

Desirable properties of pellets: [14, 15]

- **Uncoated pellets:**
  - Uniform spherical shape,
  - Uniform size,
  - Good flow properties,
  - Reproducible packing,
  - High strength,
  - Low friability, Low dust,
  - Smooth surface,
  - Ease of coating.
- **Once coated:**
  - Maintain all of the above properties,
  - Have desired drug release characteristics.

The photographical representations of different pellets are given in figure 2.

Pelletization techniques [16, 17, 18]:

The preparation of spherical agglomerates can be approached by several techniques which can be subdivided into the basic types of systems shown in figure 3.

Direct pelletizing [19]:

Means Manufacturing of pellets directly from powder.

- **Effective process:** Pellets are manufactured directly from powder with a binder or solvent, fast process. Low usage of auxiliary materials.
- **Product advantages:** Compact, round pellets - ideal for automatic dosing and even coating and Pellet diameter also obtained between 0.2 m m and 1.2 m m.
- **Comparison:** Pellets have a higher density than spray granulates and agglomerates.
- **Process principles:** Powder is mixed and moistened. A solvent or binder can also be added. The powder bed is set into a centrifugal motion. (Fluid Bed Pelletizing in the rotor). The impact and acceleration forces that occur in this process result in the formation of agglomerates, which become rounded out into uniform and dense pellets. The speed of rotation has a direct influence on the density and size of the pellets. The moist pellets are subsequently

dried in the fluid bed. If required, the systems can be made inert for applications with organic solvents. Another alternative for direct pelletizing is Spray Granulation.

- With suitable additives, pellets can be made into tablets or used to fill capsules. The round shape is ideal for uniform coating. Pellets are good for automatic dosing. The various steps of process principle are given in figure 4.

Powder layering [19]

Powder layering involves the deposition of successive layers of dry powder of drug or excipients or both on performed nuclei or cores with the help of a binding liquid. Because powder layering involves the simultaneous application of the liquid and dry powder, it generally requires specialized equipment. Pieces of equipments revolutionized powder layering processing as a pelletizing techniques are- tangential spray or centrifugal fluid bed granulators. In case of tangential spray the rotating disk and fluidization air provides proper mixing. With a double wall centrifugal granulator, the process is carried out in the open and closed position. With powder layering, the inner wall is closed so that simultaneous application of liquid and powder could proceed until the pellets have reached the desired size. The inner wall is then raised, and the spheres enter the drying zone. The pellets are lifted by the fluidization air up and over the inner wall back in to forming zone. The cycle is repeated until the desired residual moisture level in the pellets is achieved. The principle of powder layering process with different steps is completely illustrated in figure 5.

The other requirements which formulation are suppose to meet are [19]

- Binder solution must have a high binder capacity.
- Micronizing or finely milling the drug before layering improves the efficiency of the layering process.
- The rheological properties of binding liquid, the liquid application rate, and drying air temperature should be optimized.
- In addition, the powder should be delivered at a rate that maintains a balance between the surface wetness of the cores and powder adhesion.

Fluid bed coating for layering of pellets [20]

- Innovative processes for coating our products.
- Film coating; lipid hot melt coating, Coating of granules, pellets, tablets.
- Specific manipulation of the particle surface characteristics. Protection of the product against moisture, light, air.
- Specific manipulation of the way in which the particle dissolves the decomposition or the release of active ingredients.
- **Process advantages:** Uniform, continuous product coating. Aqueous or organic coatings can be applied. Coating and drying take place in one machine. In terms of Total Containment, the coating process and the filling and emptying of the

machine can be carried out in complete isolation and without product spreading into the environment.

Principle of operation of fluid bed coating [20]

With fluid bed coating, particles are fluidized and the coating fluid sprayed on and dried. Small droplets and a low viscosity of the spray medium ensure an even product coating. Glatt offers Batch Fluid Bed Systems in different batch sizes with:

a. Top Spray Coating
b. Bottom Spray Coating (Wurster Coating)
c. Tangential Spray Coating (Rotor Pellet Coating)

A. Top spray coating:

This process is used for general coatings right up to enteric coating. With top spray coating in the fluid bed (batch and continuous), particles are fluidized in the flow of heated air, which is introduced into the product container via a base plate. The coating liquid is sprayed into the fluid bed from above against the air flow (countercurrent) by means of a nozzle. Drying takes place as the particles continue to move upwards in the air flow. Small droplets and a low viscosity of the spray medium ensure that the distribution is uniform. Coating in the continuous fluid bed is particularly suitable for protective coatings/color coatings where the product throughput rates are high. The product is continuously fed into one side of the machine and is transported onwards via the sieve bottom by means of the air flow. Depending on the application, the system is sub-divided into pre-heating zones, spray zones and drying zones. The dry, coated particles are continuously extracted.

B. Bottom spray coating (Wurster coating): This process is particularly suitable for a controlled release of active ingredients. In the Wurster process, a complete sealing of the surface can be achieved with a low usage of coating substance. The spray nozzle is fitted in the base plate resulting in a spray pattern that is concurrent with the air feed. By using a Wurster cylinder and a base plate with different perforations, the particles to be coated are accelerated inside the Wurster tube and fed through the spray cone concurrently. As the particles continue traveling upwards, they dry and fall outside the Wurster tube back towards the base plate. They are guided from the outside back to the inside of the tube where they are once again accelerated by the spray. This produces an extremely even film. Particles of different sizes are evenly coated.

Bottom spray coating (Continuous fluid bed): Particularly suitable for protective coatings/color coatings where the product throughput rates are high.
The product is continuously fed into one side of the machine and is transported onwards via the sieve bottom by means of the air flow. Depending on the application, the system is sub-divided into pre-heating zones, spray zones and drying zones whereby spraying can take place from below in the form of a bottom spray. The dry, coated particles are continuously extracted.

C. Tangential spray coating (Rotor pellet coating): Ideal for coatings with high solid content. The product is set into a spiral motion by means of a rotating base plate, which has air fed into the powder bed at its edge. The spray nozzle is arranged tangentially to the rotor disc and also sprays concurrently into the powder bed. Very thick film layers can be applied by means of the rotor method. The photographical representation of top spray coating, bottom spray coating and tangential coating are displayed in figure 6.

Equipment description: A GPCG (Glatt-Powder-Coater-Granulator) [30] from Glatt are used for processes those are uniform, reproducible and gentle on the product using fluid bed techniques. Batch sizes from **5 k** g to 1.**5 t** /batch.

It offers advantages such as:

- **All-in-one:** From demanding powder coating to simple drying. Whether granulation/ agglomeration, particle coating or pelletizing. Whether spraying from above (Top Spray), from below (Bottom Spray) or from the side (Tangential Spray): simply anything is possible with a GPCG. In this way, you are just as flexible as your machine.
- **Unique technology:** All GPCGs provide an optimum ratio of air volume flow to quantity of product used. The conical pressure relief zone and the resulting reduced flow speed allow even very fine products to be processed. At the centre of granulation is the legendary Glatt single pipe nozzle. This combines outstanding spray behavior with optimum media delivery and easy cleaning.
- **Simple handling:** Both horizontal and vertical product flow can be realized with all sizes. Contained feed systems using gravity or suction can be provided. The container is emptied by rotating it in the moving carriage (up to certain batch sizes). Dust-free tipping and feeding into the container on one lifting column. Emptying can likewise be carried out from the side by means of suction or by gravity or - as the fastest and most effective method of all - vertically with the unique Glatt rotating bottom.
- **Innovative ABC-technology:** The unique ABC-technology (Anti-Bearding-Cap) allows spraying without bearding. The perfect supplement to the ABC-technology: The unique nano-coating to the nozzle prevents the deposit of coating material on the nozzle cap.
    - No process downtime due to cleaning of the nozzle
    - No blocked liquid inserts

  No interference of spray pattern

Pharmaceutical applications [20, 26]

The process of FBP is used to produce a wide variety of engineered, controlled release drugs. These solid dosage forms are mostly in the form of tablets or capsules containing high levels of an Active Pharmaceutical Ingredient (API). Product characteristics include:

- Dense pellets

- Smooth coatable pellets
- Narrow particle size distributions, and
- High yield and flow ability.

Important pharmaceutical applications include:

- Controlled release pellets for encapsulations
- Sustained release pellets / Delayed release enteric coated pellets
- Multi-particulate systems
- Multi-unit erosion matrix pellets
- Pellets for special tableting applications
- Immediate release pellets for sachets

Conclusion:

The challenges in preparing tablets from coated pellets are evident. Various formulation and process parameters have to be optimized in order to obtain tableted reservoir-type pellets having the same properties, and, in particular, release properties as the original, uncompacted pellets. The most important variable is the type of polymer selected for the coating of the pellets. The polymer coating must remain intact during compaction in order to extend the drug release. Traditionally used polymers for the coating of solid dosage forms which do not resist the mechanical stress during compaction (e.g. ethyl cellulose) are not suitable for the preparation of compacted pellets. The polymers have to be flexible enough to not rupture. The formulations of the pellet core and the final tablet have to be carefully selected in order to prevent the rupture of the coating, and to obtain tablets with proper content uniformity, hardness and rapid disintegration. Key variables include the pellet: excipient ratio and the compression force. Microcrystalline cellulose appears to be the excipient of choice because of its good compaction and disintegration properties.

References:

1. Ghebre-Sellassie, I., Pharmaceutical Pelletization Technology, Marcel Dekker, Inc., New York, 1989.
2. P. J. Sherrington, and R. Oliver, Globulation processes, in granulation, Heyden and Son ltd., London, pp. 118 – 140, (1981).
3. I. M. Jalal, H.J. Malinowski, and W.E. Smith, J. Pharm. Sci., 61:1466-790 (1972).
4. H .J. Malinowski, and W.E. Smith, J. Pharm. Sci., 63:285-288 (1974).
5. H. Bechgaard and G. H. Neilson, Drug, Dev. Ind. Pharm., 4:53-67 (1978).
6. Parikh, B.M. (1990) Alternatives for Processing Spherical Granules, paper presented at Interphex USA, 10 May, New York, NY, USA
7. Vervaet, C., Baert, L. and Remon, J.P. (1995) Int. J. Pharm. 116, 131–146.
8. Eskilson, C. (1985) Manuf. Chem. 56(3), 33–39.
9. Bechgaard,H. and Hegermann-Nielsen, G.(1978) Drug Dev. Ind. Pharm. 4, 53–67.
10. Ghebre-Sellassie, I. (1989) in Pharmaceutical Pelletization Technology

(Ghebre-Sellassie, I., ed.), pp. 1–13, Marcel Dekker.
11. Govender,T. and Dangor, C.M. (1997) J. Microencapsulation 14, 445–455.
12. Reynolds, A.D. (1970) Manuf. Chem.Aerosol News 41, 40–43.
13. Bechard, S.R. and Leroux, J.C. (1992) Drug Dev. Ind. Pharm. 18, 1927–1944.
14. H. Bechgaard, Distribution of different types of dosage forms in the gastrointestinal tract, in topics in pharmaceutical Science (D.A. Bremer and P. Speiser, eds.), Elsevier, New York (1983).
15. R. Groning And G. Henn, Drug Dev. Ind. Pharm., 10:527-539 (1984).
16. P. J. Sherrington, and R. Oliver, Globulation processes, in granulation, Heyden and Son ltd., London, pp. 118 – 140, (1981).
17. Special delivery: Advances in drug therapy, The Research News, University of Michigan, p.1 (1986).
18. http://www.andrx.com
19. http://www.glatt.com/e/01_technologien/01_03_04.htm
20. http://www.glattpharmaceutical.com/e/04_technologies/04_01_05.htm
21. Ghebre-Sellassie I. Multiparticulate Oral Drug Delivery. New York: Marcel Dekker, 1994.
22. Bechgaard H. Nielson GH. Drug Dev. Ind. Pharm. 1978:4:53-- 67.
23. McGinity JW. Aqueous Polymeric Coatings for Pharmaceutical Dosage Forms. New York: Marcel Dekker. 1989.
24. Cole G, Hogan J, Aulton M. Pharmaceutical Coating Technology. London: Taylor and Francis, 1995.
25. www.lcicorp.com
26. R. Wiwattanapatapee , A. Pengnoo , M. Kanjanamaneesathian , W. Matchavanich, L. Nilratana and A. Jantharangsri Journal of Controlled Release, Volume 95, Issue 3, 24 March2004,455-462

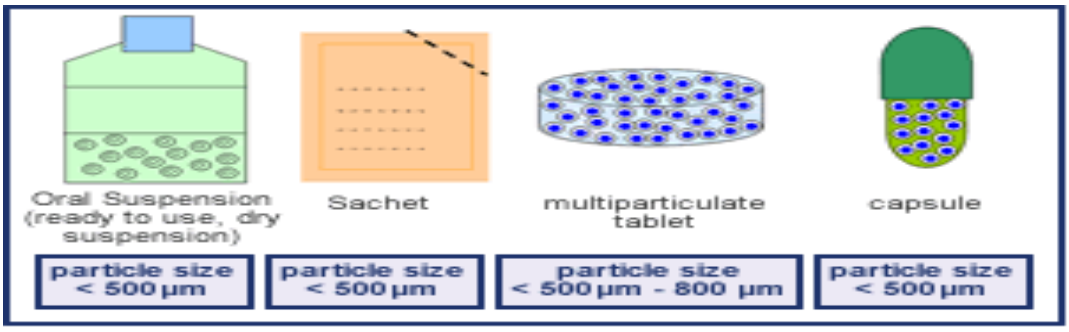
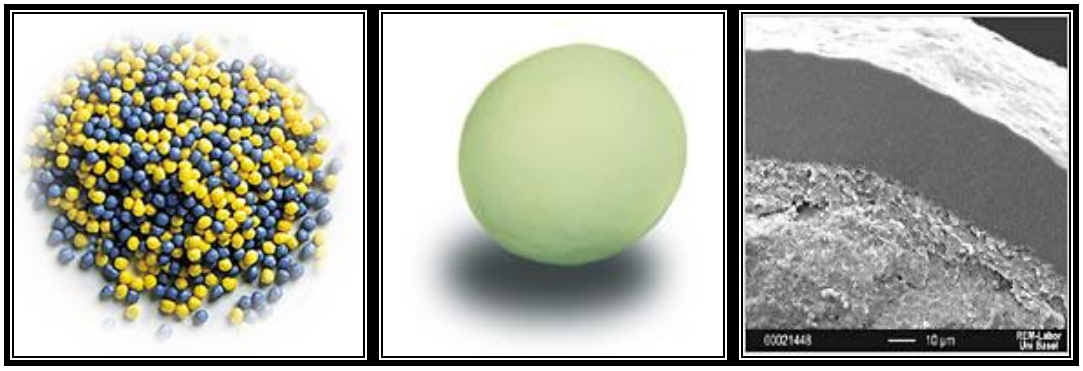


Figure: 1 Flexibility of pellets in development of dosage form



(a) (b) (c)

Figure: 2. (a) Pellets, (b) Perfect pellet, (c) Coated pellet

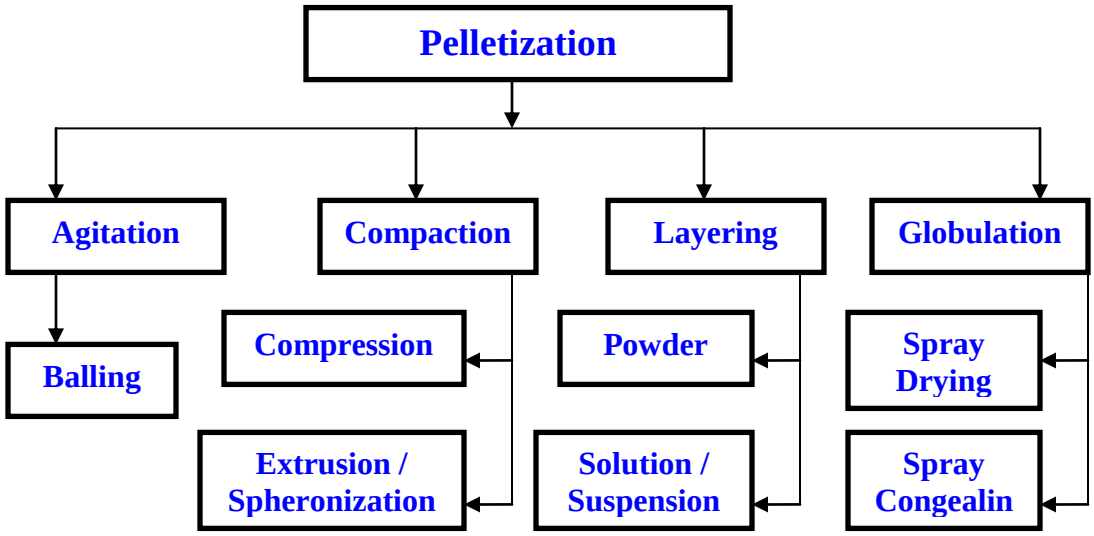


Figure 3 Different pelletization techniques

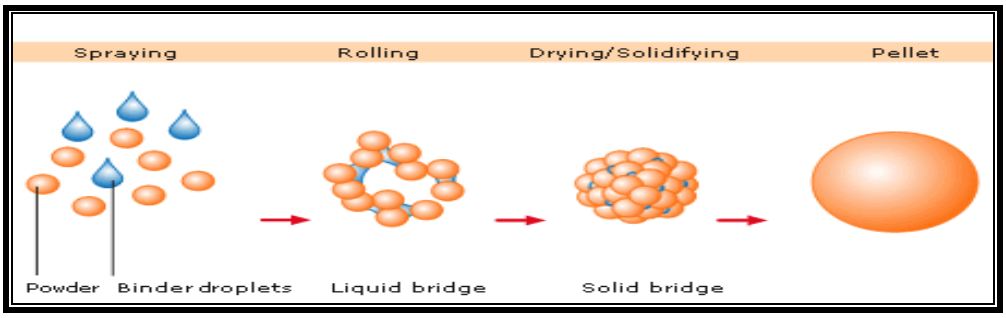


Figure 4: Process principles of Direct pelletizing

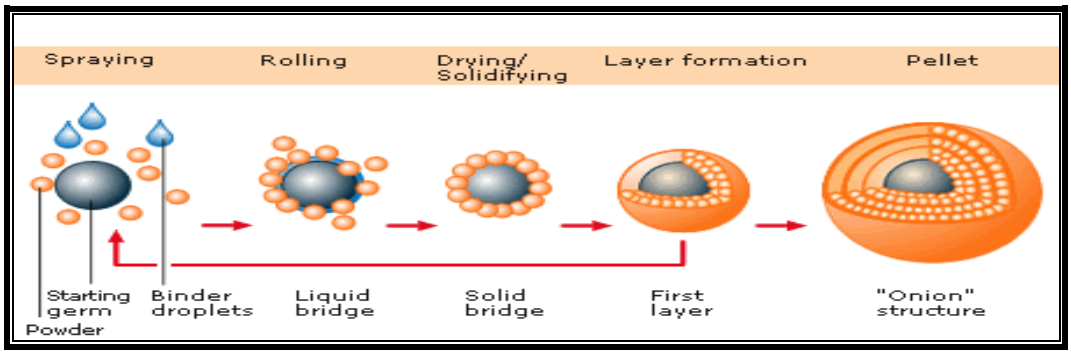
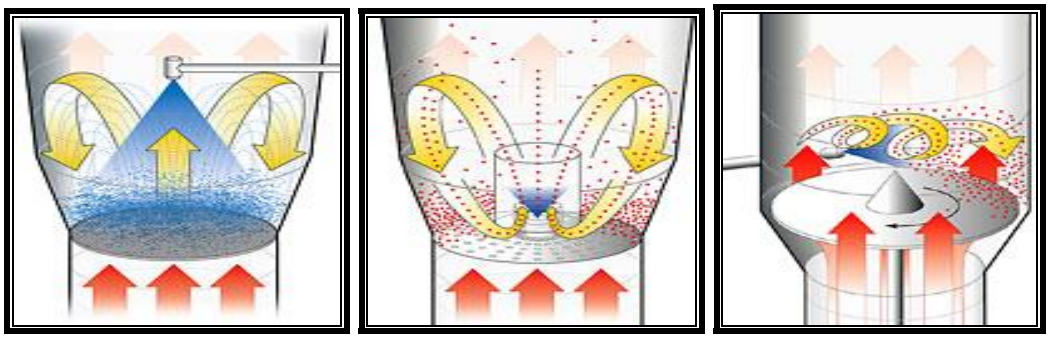


Figure 5: Principle of Powder layering process



(a) ***(b)*** ***(c)***

Figure 6: (a) Principle of Top spray, (b)Bottom spray, & (C) tangential spray coating

PHYSICIANS PRESCRIBING PATTERNS OF ORAL ANTIDIABETIC DRUGS

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Abstract

Physicians prescribing pattern of oral antidiabetic drugs may be key to avoid the serious complications of patients suffering from type 2 diabetes. However, fixed dose combinations were often prescribed to achieve target glycemic levels. Treatment complexity can be reduced by prescribing a fixed dose combination of two or more oral antidiabetic drugs. There are good numbers of studies which suggest the use of fixed dose combinations not only to reduce the complications of diabetes but also to improve adherence. A variety of fixed dose combination oral antidiabetic drugs in different dosage strengths are available and the strategies for selecting such fixed dose combinations options depends on physicians prescribing behavior and patients condition. This article describes the increasing preference of physicians to prescribe fixed dose combinations of oral antidiabetic drugs.

Keywords: Fixed dose combinations, oral antidiabetic drugs, physicians prescribing pattern.

Introductions

To understand the intricacies behind the current diabetes practice in India, it is important, to understand the physician's perceptions, attitudes and practices[1].

Several studies suggest the use of combination of two or more antidiabetics drugs with different mechanism of action for the management of hyperglycemia in type 2 diabetes patients. A few studies demonstrate the comparison of low dose fixed dose combinations vs high dose single component products, a few studies describe the safety and efficacy of FDCs, a few studies did a comparative evaluation of monotherapy, combination therapy and fixed dose combination therapy and a few studies have stated the medication adherence and health related costs in type 2 diabetic patients[2-26]. As many fixed dose combinations containing two or more oral antidiabetics drugs are available in the market, physicians are preferring to prescribe. Physicians prescribing preference is may be due to convenience, reduced pill burden or may be due to simplified regimen and the range of dosage strengths which allow flexible dose titration. There are a few studies which also describe the complexities associated with fixed dose combinations of oral antidiabetic drugs apart from their advantages[27].

Use of insulin in combination with Oral Antidiabetic Drugs (OADs) is also gaining importance. There are handful of studies and guidelines which recommend use of insulin in combination with OADs. It has been observed that 30 to 40% of patients can achieve the glycemic targets by combination of once daily premix insulin with OADs. However, the therapy needs to be intensified with the decline of ß-cell function (= insulin secretion) as disease progresses. In this case premix insulin should be scaled up to twice and thrice daily with or without one or multiple class of OADs. Premix insulin can be combined with insulin sensitizers and secretagogues when initiated once daily, nonetheless, OADs can be continued with twice and thrice daily premix insulin therapy.

Objectives of the study

To understand the physicians prescribing patterns with respect to Oral antidiabetic drugs. Survey was carried out among the physicians to mainly understand the following aspects:

- Frequency of fixed dose combination prescriptions
- Conditions for which FDCs were usually preferred
- Preferred oral antidiabetic fixed dose combinations
- Reasons for prescribing FDCs

Research Methodology

Research Design

Information with regard to the prescribing pattern of fixed dose combinations of antidiabetic drugs was collected. This information would give an idea whether physicians prefer to prescribe fixed dose combinations, if so in which conditions and their experiences on such combinations.

Research Type

Research type was exploratory. Exploratory research was conducted after thorough search of secondary data available.

Questionnaire Method

Questionnaire technique was followed to collect the information from the respondents. Questionnaire was developed in such a way that the respondents could answer the questions with ease. Effort was put to reduce the number of questions so that the respondents take less time to answer the questions as the respondents were physicians. Structured direct survey method was adopted for collecting the information from the respondents. A direct approach was pursued as the purpose of the study was disclosed or was obvious to the respondents. Questionnaire consisted of mostly fixed alternative questions (Multiple choice and dichotomous), where the respondent has to select from predetermined alternatives. There were a few unstructured open ended questions for which the respondents had to write down the answers. Apart from the basic information i.e the information related to the direct research problem, classification information, consisting of socioeconomics and demographic was also collected.

Pretesting of the questionnaire was done in small sample of respondents (n=10) and possible errors were eliminated. After

elimination of the errors, questionnaire was drafted and the responses were collected.

Sampling

Sampling design was done keeping in mind the target population. The target population was physicians who prescribe antidiabetic drugs. Information about prescription preference of fixed dose combination was collected. Study was carried out in five places namely Bangalore, Cochin, Hyderabad, Mangalore, Manipal and Udupi.

Nonprobability sampling technique was adopted where it was decided arbitrarily which elements to be included in the sample. Convenience sampling was chosen, study units that happen to be available at the time of data collection were selected in the sample.

Initial target sample size was 80. 20 each from Bangalore, Cochin, Hyderabad and 20 from Mangalore, Manipal and Udupi put together. Final sample size used for evaluation was 60. 20 questionnaire responses were not considered for evaluation as there were some incomplete responses. The sample was selected on pragmatic criteria.

Respondents in the study were General Practitioners, Diabetologists and endocrinologists.

Inclusion/Exclusion Criteria

Physicians prescribing antidiabetic irrespective of their specialization were included in the study and the physicians having practice less than 5 years were excluded from the study.

Results and Discussion

Specialization and average duration of practice of 62 doctors is summarized in the table 1. Out of 62 doctors, fifty one were general physicians who were treating mostly diabetic patients, nine diabetologists and two endocrinologists. The average duration of practice was 14.5 years; general physicians (17.8), diabetologists (12.9) and endocrinologist (12.5).

Table 1 – Specialization of the Doctors

Specialty	Number of doctors	Average duration of practice
General Physicians	51	17.8
Diabetologists	09	12.9
Endocrinologists	02	12.5

Less duration of practice with respect to diabetologists and endocrinologist was probably because of the fact that diabetes became a super specialty only recently.

Table 2 – Number of Patients Attended by Doctors

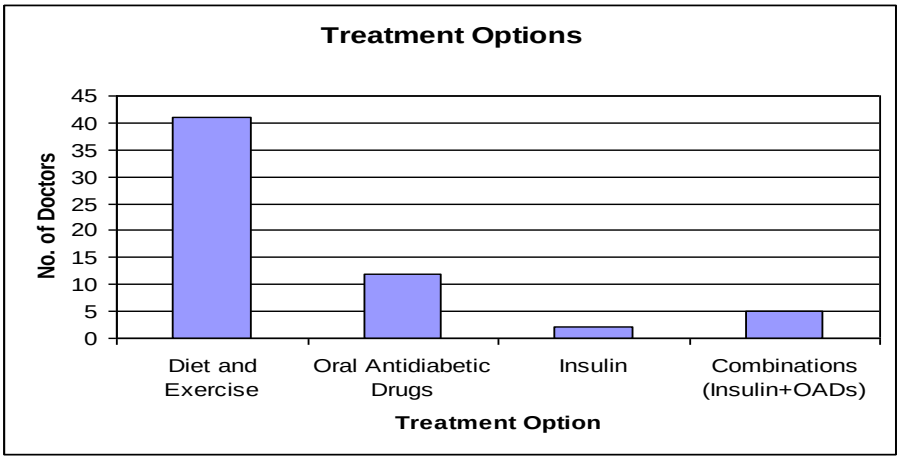
Number of type 2 diabetes patients	Number of Doctors
Less than 40	04
40 to 60	05
60 to 80	20
80 to 100	33

It is evident that 53% of physicians see between 80 to 100 patients with type 2 diabetes in a month, followed by 32% in the range of 60-80. Only a very few physicians (6%) see less than 40 patients respectively. This gives a rough picture about number of individuals suffering from type 2 diabetes.

Table 3 – Treatment Options

Treatment Option	Number of Doctors
Diet and Exercise	41
Oral Antidiabetic drugs (OADs)	12
Insulin	02
Combination (OADs+Insulin)	05

Figure 1 – Treatment Options



Non pharmacological treatment was preferred by most physicians (85%) soon after the patients were diagnosed with type 2 diabetes. Total of 12% doctors prescribe OADs and few doctors prescribe insulin (2) and combination of OAD and Insulin (5). Although most of the doctors preferred diet and exercise and Oral Anti-diabetic drugs, insulin initiation and combination of insulin and OADs cannot be neglected. There was one study conducted in Urban and Semi urban Bangalore district, where less number

physicians were opting for nonpharmacological treatment (Rayappa PH, Raju KNM, Kapur A. Personnel communication) contradictory to the present study results.

It was observed that most respondents (85%) approach was more aggressive when patients were not responding to non-pharmacological treatment or initial oral antidiabetic drugs. They were treating type 2 diabetes patients with all three options: diet and exercise, OADs and Insulin. This aggressive treatment approach by doctors might be due their experience in controlling blood glucose levels or they were made aware of how to lower the blood glucose levels effectively.

Table 4 – Fixed Dose Combination Prescriptions

Response	Number of Doctors
Yes	60
No	02
Total	N=62

Most respondents (96%) of the study stated that they prescribe antidiabetic fixed dose combinations. Two responded in negative, one respondent commented that he was never impressed with the combinations available in the market and also read about the recent issues on irrationality of fixed dose combinations and another respondent reported that there is no need of prescribing fixed dose combinations and said most of the combinations are irrational in one way or the other. He also emphasized that, if one uses more drugs, there would be more side effects.

Although majority of the respondents were prescribing FDCs, the irrational FDCs issue in the recent past may disturb the physicians' preference to prescribe FDCs in general. It is essential for the companies who manufacture FDCs to bring it to notice of the physicians that their combinations are rational and have been approved by Drugs Controller General of India (DCGI).

Table 5 – Frequency of prescribing FDCs

Response	Number of Doctors
Every Patient	00
Every other patient	12
If deemed necessary	48
Total	60

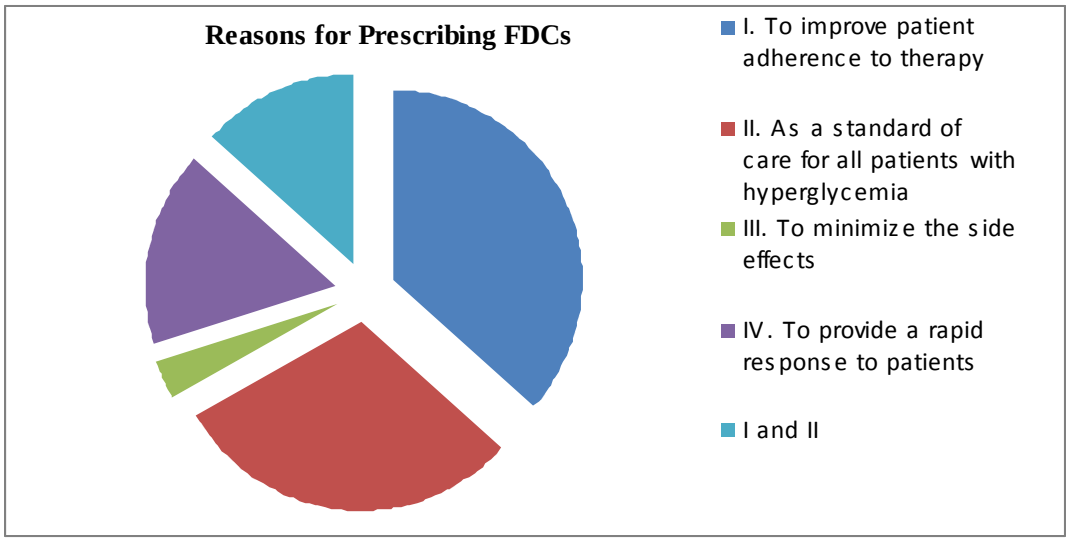
Most physicians (73%) reported that they would only prescribe antidiabetic fixed dose combination if deemed necessary for the patients suffering with type 2 diabetes. All patients with type 2 diabetes may not require to be treated with antidiabetic FDCs. It is

essential to screen the blood glucose levels before prescribing antidiabetic fixed dose combinations.

Table 6 – Conditions for which FDCs are Prescribed

Category	Number of Doctors
I. To improve patient adherence to therapy	22
II. As a standard of care for all patients with hyperglycemia	18
III. To minimize the side effects	02
IV. To provide a rapid response in patients	10
I and II	08
Total	60

Figure 2 – Conditions for which FDCs are Prescribed



Most physicians (36%) who responded to the question affirmed that they prescribe FDCs to improve patient adherence to therapy and as a standard of care for all patients with hyperglycemia (30%). A few physicians (16%) stated that they prescribe FDCs to provide rapid response to the patients and only two physicians (3%) had stated they prescribe for minimizing the side effects.

Responses observed above are comparable with the advantages offered by fixed dose combinations.

Table 7 – Most Prescribed FDCs

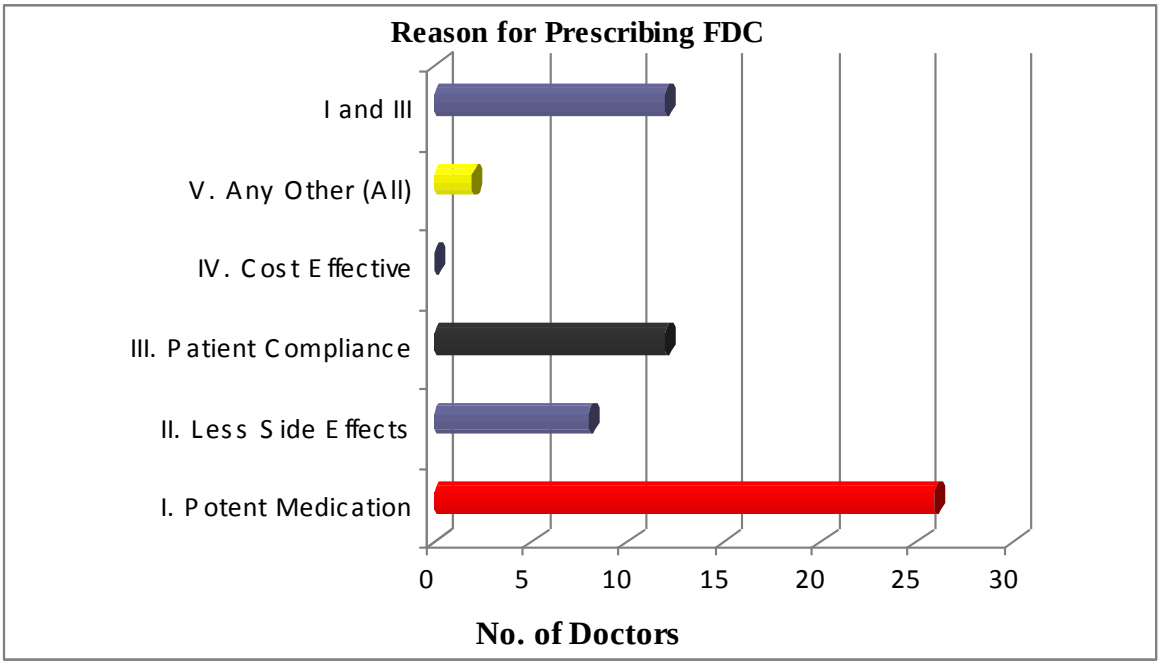
Fixed dose Combination	Number of Doctors
Glimiperide+Metformin	09
Glipizide+Metformin	35
Pioglitazone+Metformin	24
Pioglitazone+Glimepiride	11
Rosiglitazone+Metformin	02
Any Other (Diabecon)	01

Majority of the doctors (44%) were prescribing Glipizide+Metformin combination followed by Pioglitazone+Metformin combination (29%). A few doctors were prescribing, Pioglitazone+Glimeperide (13%), Glimeperide+Metformin (11%) and Rosiglitazone+Metformin (2%) combinations. It was observed that one doctor is convinced of an herbal preparation and found improvement in disease status when prescribed as an adjuvant to an OAD. Although there are lots of antidiabetic fixed dose combinations available in the market, only a few combinations are mostly prescribed by the doctors.

Table 8 – Reasons for Prescribing FDC

Response	Number of Doctors
I. Potent Medication	26
II. Less Side Effects	08
III. Patient Compliance	12
IV. Cost Effective	00
V. Any Other (Rational Combinations)	02
I and III	12
Total	60

Figure 3 – Reasons for Prescribing FDC



Most of the doctors had affirmed that pioglitazone+metformin and glipizide+metformin are very effective and the reason behind its effectiveness was potent medication. Not a single respondent have specified that they prescribe the combinations because of cost effectiveness. This shows the attitude of physicians towards cost of medicine and also gives an indication that they would overshadow the cost factor over other factors like effective drug, patient compliance and less side effects.

Conclusion

India is considered to be diabetes capital of the world and was even evident from the study where doctors were attending more than 80 patients in a month. Indians are more prone to develop diabetes due to life style and food habits. Moreover complications start at younger age. Consequently burden of uncontrolled diabetes in India is high with more than two third of the treated patients not achieving optimal glycemic control. This may be attributed to low purchasing power, inadequate access to health care facilities in remote areas of our country and most importantly diabetes patients are treated by general physicians who were not aware of guidelines which should be followed in Indian context.

It was clear from the study that majority of the doctors were aggressive in treating diabetic patients by all possible means. It was observed that doctors start treatment with diet and exercise and then would prescribe OADs or put patients on Insulin.

Although new classes of medication and numerous combinations have been demonstrated to lower glycaemia, doctors were finding it difficult to achieve and maintain the optimal blood glucose levels. However, fixed dose combination antidiabetic drugs were being preferred by most of the respondents due to their advantages.

References

1. Kapur A, Shishoo S, Ahuja MMS, Sen V, Mankame K. Diabetes Care in India: Physicians Perceptions Attitudes and Practices. Int J Diab Dev Countries. 1998;18:124-130.
2. Hays R, Kravitz R, Mazel R. et al. The impact of patient adherence on health outcomes for patients with chronic disease in the Medical Outcomes Study. Journal of Behavioral Medicine. 1994; 17: 347–360.
3. Brown JB, Nichols GA, Glauber HS, Bakst A. Ten-year follow-up of antidiabetic drug use, nonadherence, and mortality in a defined population with type 2 diabetes mellitus. Clinical Therapeutics. 1999 Jun;21(6): 1045–1057.
4. Erle G, Lovise S, Stocchiero C. et al. A comparison of preconstituted, fixed combinations of low-dose glyburide plus metformin versus high-dose glyburide alone in the treatment of type 2 diabetic patients. Acta Diabetologica. 1999 Jun;36(12): 61–65.
5. Blonde L, Rosenstock J, Mooradian AD, Piper BA, Henry D. Glyburide/metformin combination product is safe and efficacious in patients with type 2 diabetes failing sulphonylurea therapy. Diabetes, Obesity & Metabolism. 2002 Nov;4(6): 368–375.
6. Garber AJ, Larsen J, Schneider SH, Piper BA, Henry D. Glyburide/Metformin Initial Therapy Study G. Simultaneous glyburide/metformin therapy is superior to component monotherapy as an initial pharmacological treatment for type 2 diabetes. Diabetes, Obesity & Metabolism. 2002 May;4(3): 201–208.
7. Garber AJ, Bruce S, Fiedorek FT. Durability of efficacy and long-term safety profile of glyburide/metformin tablets in patients with type 2 diabetes mellitus: an open-label extension study. Clinical Therapeutics. 2002 Sep;24(9): 1401–1413.
8. Marre M, Howlett H, Lehert P, Allavoine T. Improved glycaemic control with metformin-glibenclamide combined tablet therapy (Glucovance) in Type 2 diabetic patients inadequately controlled on metformin. Diabetic Medicine. 2002 Aug;19(8): 673–680.
9. Melikian C, White TJ, Vanderplas A, Dezii CM, Chang E. Adherence to oral antidiabetic therapy in a managed care organization: a comparison of monotherapy,

combination therapy, and fixed-dose combination therapy. Clinical Therapeutics. 2002 Mar;24(3): 460–467.

10. Schectman JM, Nadkarni MM, Voss JD. The association between diabetes metabolic control and drug adherence in an indigent population. Diabetes Care. 2002 Jun;25(6): 1015–1021.
11. Balkrishnan R, Rajagopalan R, Camacho F, Huston S, Murray F, Anderson R. Predictors of medication adherence and associated health care costs in an older population with type 2 diabetes mellitus: a longitudinal cohort study. Clinical Therapeutics. 2003; 25(11): 2958–2971.
12. Blonde L, Wogen J, Kreilick C, Seymour AA. Greater reductions in A1C in type 2 diabetic patients new to therapy with glyburide/metformin tablets as compared to glyburide co-administered with metformin. Diabetes, Obesity & Metabolism. 2003 Nov;5(6): 424–431.
13. Duckworth W, Marcelli M, Padden M. et al. Improvements in glycemic control in type 2 diabetes patients switched from sulfonylurea coadministered with metformin to glyburide-metformin tablets. Journal of Managed Care Pharmacy. 2003 May–Jun;9(3): 256–262.
14. Garber A, Marre M, Blonde L. et al. Influence of initial hyperglycaemia, weight and age on the blood glucose lowering efficacy and incidence of hypoglycaemic symptoms with a single-tablet metformin-glibenclamide therapy (Glucovance) in type 2 diabetes. Diabetes, Obesity & Metabolism. 2003 May;5(3): 171–179.
15. Garber AJ, Donovan DS Jr., Dandona P, Bruce S, Park J-S. Efficacy of glyburide/metformin tablets compared with initial monotherapy in type 2 diabetes. Journal of Clinical Endocrinology & Metabolism. 2003 Aug;88(8): 3598–3604.
16. Goldstein BJ, Pans M, Rubin CJ. Multicenter, randomized, double-masked, parallel-group assessment of simultaneous glipizide/metformin as second-line pharmacologic treatment for patients with type 2 diabetes mellitus that is inadequately controlled by a sulfonylurea. Clinical Therapeutics. 2003 Mar;25(3): 890–903.
17. Grant RW, Devita NG, Singer DE. et al. Polypharmacy and medication adherence in patients with type 2 diabetes. Diabetes Care. 2003; 26: 1408–1412.
18. Krapek K, King K, Warren SS. et al. Medication adherence and associated hemoglobin A1c in type 2 diabetes. Annals of Pharmacotherapy. 2004 Sep;38(9): 1357–1362.
19. Lau DT, Nau DP. Oral antihyperglycemic medication nonadherence and subsequent hospitalization among individuals

with type 2 diabetes. Diabetes Care. 2004 Sep;27(9): 2149–2153.

20. Vanderpoel DR, Hussein MA, Watson-Heidari T, Perry A. Adherence to a fixed-dose combination of rosiglitazone maleate/metformin hydrochloride in subjects with type 2 diabetes mellitus: a retrospective database analysis. Clinical Therapeutics. 2004 Dec;26(12): 2066–2075.
21. Bruce S, Park JS, Fiedorek FT, Howlett HCS. Beta-cell response to metformin-glibenclamide combination tablets (Glucovance) in patients with type 2 diabetes. International Journal of Clinical Practice. 2006 Jul;60(7): 783–790.
22. Mateo J, Gil-Guillen VF, Mateo E. et al. Multifactorial approach and adherence to prescribed oral medications in patients with type 2 diabetes. International Journal of Clinical Practice. 2006; 60: 422–428.
23. Rosenstock J, Rood JA, Cobitz AR, Biswas N, Chou H, Garber A. Initial treatment with rosiglitazone/metformin fixed-dose combination therapy compared with monotherapy with either rosiglitazone or metformin in patients with uncontrolled type 2 diabetes. Diabetes, Obesity & Metabolism. 2006; 8(6): 650–660.
24. Bangalore S, Kamalakkannan G, Parkar S, et al. Fixed-dose combinations improve medication compliance: a meta-analysis. Am J Med. 2007;120:713–9.
25. Chou HS, Palmer JP, Jones AR, Waterhouse B, Ferreira-Cornwell C, Krebs J, Goldstein BJ: Initial treatment with fixed-dose combination rosiglitazone/glimepiride in patients with previously untreated type 2 diabetes. Diabetes Obes Metab. 2007 Jul 21.
26. Bailey CJ, Day C. Fixed-dose single tablet antidiabetic combinations. Diabetes Obes Metab 2009; 11: 527–533.
27. Bailey CJ. Whence and whither the fixed-dose combination? Diabetes Vasc Dis Res. 2005; 2: 51–53.