IN-HOUSE MULTI DISCIPLINARY ANNUAL JOURNAL

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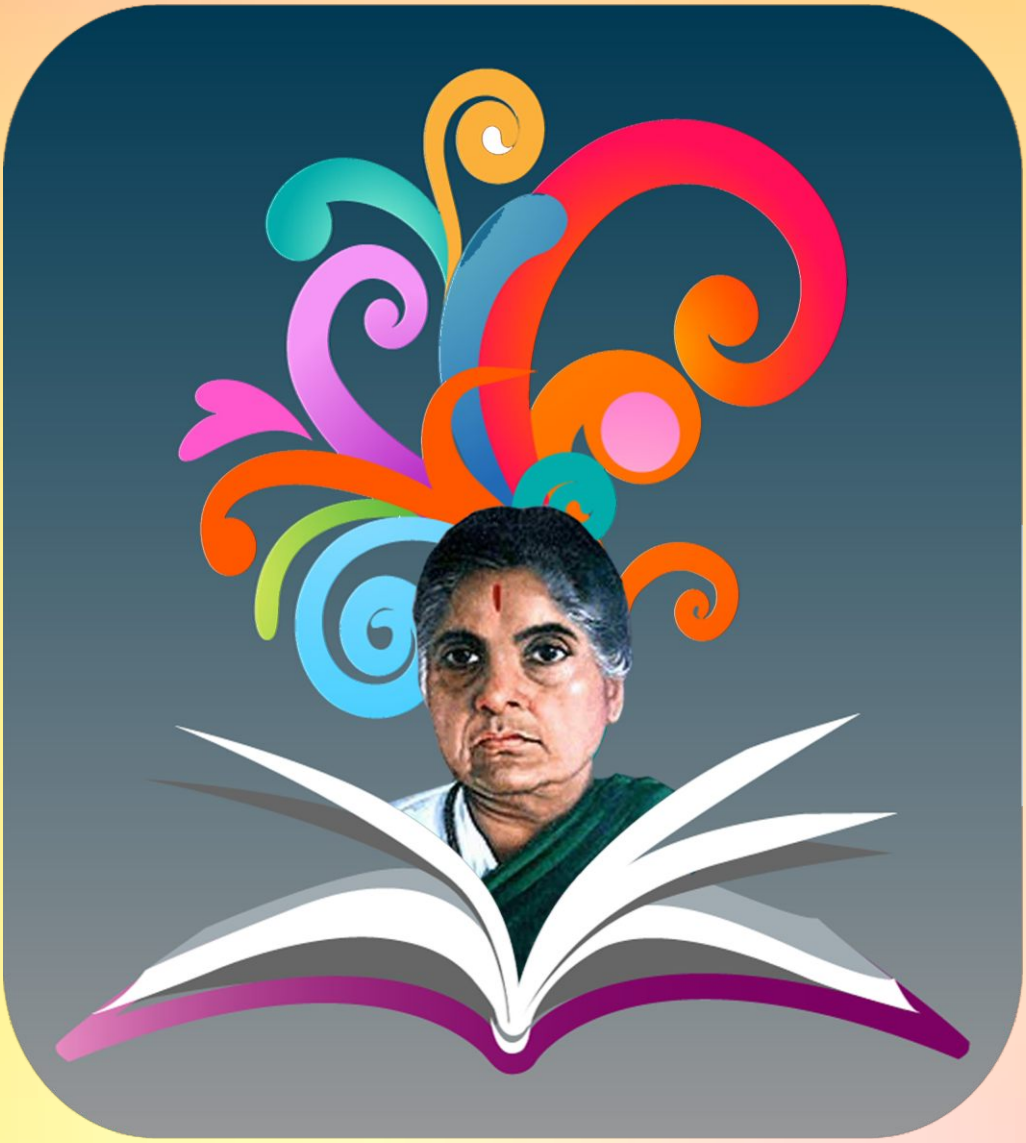
# SAMANVAY

In Pursuit of Excellence



ANDHRA MAHILA SABHA
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# VISION, MISSION, QUALITY POLICY

**Dr. (Smt) Durgabai Deshmukh**

**(15th July 1909 – 9th May 1981)**

## The Motto

*"Building Better Lives for Women"*

*To Provide instruction and training to women for harnessing their services in building our Nation*

We, at Andhra Mahila Sabha Arts & Science College for Women, have tried to follow the best part of the system and procedures which are in vogue in contemporary educational institutions and other citadels of higher learning to derive benefit out of faithful implementation of the same which will enable not only elevating our quality but also serve as a trend setter for the educational sector as a whole.

Our Vision and Mission statements reflect our yearning to build better lives for women.

## VISION

To provide education which is enriching, challenging and innovative to the deprived sections of the society with special emphasis on *adolescent girls* to join the main stream not as *beneficiaries or recipients* but as *participants* in societal growth.

## MISSION

- Offer undergraduate and postgraduate programs with concern for values and women's development.
- Provide an environment, which nurtures inherent learning skills.
- Respond to the changing needs of the community.
- Ensure committed leadership and continuous professional enrichment of staff within a participatory management process, developing the total personality and critical thinking skills of women.

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# Research Training & Consultancy Cell

The college has established Research Training & Consultancy cell with Dr. G.N. Bhagya Rekha, Principal as its chairperson, & Dr.K.Kiranmai, Associate Professor, Department of Chemistry as its Convener in order to promote research activities among the students and staff of the college. All the Heads of Departments also act as members of the cell which provides valuable suggestions / inputs in carrying out research work in the college, to encourage debate, discussion and sharing of ideas on research among the staff.

**Objectives of Cell**

- To organize the talks by experts in research field.
- Paper presentation, articles publications,
- Workshops/seminars/conferences for dissemination of research findings.

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**DURGABAI DESHMUKH MAHILA SABHA**
**(ANDHRA MAHILA SABHA)**
(Registration No.8 of 1948-49 under Indian Societies Registration Act)
Founder President Late **Dr. (Smt.) Durgabai Deshmukh**
Mahila Sabha Buildings, University Road, Hyderabad - 500 044 (Telangana) INDIA



Date : 13-3-2018

## MESSAGE

It gives me immense pleasure to know that Arts & Science College for Women, Andhra Mahila Sabha is setting up a Research and Training Consultancy Cell. It is a good initiative as it promotes conducive research culture in the institution and provides an opportunity to the staff to explore the various researchable issues, present papers on their own research topics and further their knowledge.

It is heartening to note that the Research & Consultancy Cell also proposes to bring out an in-house multi-disciplinary annual journal "SAMANVAY". The Research journal will provide a creative atmosphere in which higher studies and research thrive amongst the faculty and students.

Best educational institutions always achieve greatness not with the passage of time but for their commitment, dedication and qualitative output. The step taken by the college to start the Research Cell therefore is in the right direction.

I congratulate the management for taking this new initiative to create zeal among students and staff towards research and innovation.

I wish the Research and Training Consultancy Cell a good success and earnestly hope that the institution will make further strides in all its academic endeavours.

M. Lalitha Kameswari

**(Dr. M. Lalitha Kameswari)**
General Secretary, DDMS (AMS)

**Dr. Shivaraj** M.Sc. Ph.D
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Date : 14-3-2018

# MESSAGE

I am delighted to know that the **Andhra Mahila Sabha** college has initiated to setup Research Training and Consultancy Cell and bringing out an in house multi disciplinary Annual Journal **SAMANVAY**.

This Journal will provide an excellent opportunity to the enthusiastic staff, research scholars and students to publish their innovative work. Research in Chemical Sciences, Life Sciences, Humanity and Arts & Social Sciences has been the key to the development of new products and processes that improve human welfare and economies.

I Congratulate and compliment the efforts of Principal & Staff of the **Andhra Mahila Sabha** College in bringing out the Journal.

*I wish all the best in publishing the Journal.*

**Prof. Shivaraj**
Principal

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**Prof. P. Ramaiah**
Chairman, AMS ASCW
**Sri G. Sethu Madhava Rao**
Secretary and Correspondent
AMS ASCW

Date : 13-3-2018

# MESSAGE

I feel privileged to give a message for "SAMANVAY" inaugural issue of annual in-house inter disciplinary journal of the College.

On this occasion I congratulate the Principal and her team for bringing out this journal. I also congratulate all the faculty members who contributed papers for publishing this journal.

I believe this helps to promote an intellectual culture – a culture that is based on values of research, exchanges and acceptance of ideas. It is also going to be a platform to promote research through free debate and communications between the academia research and the students.

With Good Wishes

**Prof. P. Ramaiah**
Chairman
AMS ASCW

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Secretary and Correspondent
AMS ASCW

# MESSAGE

I deem it a privilege to send a message to "SAMANVAY" which is the first bi-annual inter disciplinary in-house research news journal of the college.

Let me congratulate the Principal and her team for having put together all the turns and twists in their initiative to set up a Research, Training and Consultancy Cell and also for bringing out the first issue. On the occasion of the launch of the RT&CCI congratulate all the faculty members and the students for their contribution. My best wishes to each one of them.

The Vision and Mission of the Research, Training and Consultancy Cell I believe, should be to provide not only a forum for publishing research ideas on important topics and policy issues of national and international interest to stimulate inter-disciplinary discussion but also build capacities of the faculty overtime in order to empower them to take up training as well as consultancy services across disciplines in this globalized era which would be highly laudable.

I earnestly believe that this special issue will carry the blessings of our beloved founder madam Padma vibhushan Dr. Durgabai Deshmukh and be cherished by the students and faculty for their life time which carries valuable inputs on topics of contemporary interest to all.

I foresee that the research news journal would turn out to be of great value coming from the portals of the RT&CC of this prestigious college whose next decadal issue will carry the wisdom and values as the best in-house research journal in the academic world.

With best wishes to one and all.

**Dr. Usha Munipalle**
Chairperson I/c
AMS ASCW

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Chairman, AMS ASCW
**Sri G. Sethu Madhava Rao**
Secretary and Correspondent
AMS ASCW

Date : 13-3-2018

# MESSAGE

I would like to express my sincere congratulations to the Convener of the Journal and her team on the release of first issue of the In House Inter Disciplinary Annual Journal of the College "SAMANVAY". On this occasion I would like to encourage the faculty for contributing their articles with the aim to provide as a platform to exchange the ideas in their respective fields, to equip with knowledge to develop innovative ideas.

I once again congratulate & encourage bringing about qualitative In House Inter disciplinary Journal "SAMANVAY".

Bhagyarekha

**Dr. G.N. Bhagya Rekha**
Principal

# EDITOR'S DESK

The college has established a research training and consultancy cell in order to promote and inculcate interest in research activities among the students and staff of the college. To organize the talks by experts in research fields, paper presentation, articles publications are the objectives of the cell. As a part of the activity of research training consultancy cell it is bringing out the first issue "SAMANVAY" which is the in-house inter disciplinary annual journal of the college. The Research, Training and Consultancy Cell is to provide platform for publishing research ideas on important topics and policy issues of national and international issues & to take up training as well as consultancy services across disciplines. This first edition includes articles papers and reviews on certain topics.

***– Dr. K. Kiranmai***

# INDEX


1. A FOCUS ON BREAST FEEDING AMONG MOTHERS IN URBAN SLUM AREA OF MANSURABAD, HYDERABAD — 10
   **Dr. D. Rajeswari[1], Dr. D. Ravi Babu[2], Dr. P. Rama Rao[3] and Kalpana[4]**

2. EMPOWERING WOMEN THROUGH PHYSICAL EDUCATION — 16
   **Dr. M. Sridevi**

3. CHALLENGES AND OPPORTUNITIES OF E-MARKETING — 21
   **Thota Radha**

4. APPLICATION OF DIFFERENTIAL EQUATIONS IN VARIOUS FIELDS — 27
   **P. Sarada[1], Ms. P.R. Jayasree[2]**

5. NANOTECHNOLOGY IN CANCER THERAPY — 35
   **Vishwanath Pavani**

6. NANOPARTICLES OF BIODEGRADABLE POLYMERS FOR CANCER DIAGNOSIS — 40
   **K.Laharika Dasharath**

# A Focus on Breast Feeding among Mothers in Urban Slum Area of Mansurabad, Hyderabad

**Dr. D. Rajeswari[1], Dr. D. Ravi Babu[2], Dr. P Rama Rao[3] and Kalpana[4]**

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[2]Professor and Head of the Dept.SPM, KAMSRC HYD

[3]Tutor, Dept. of SPM, KAMSRC HYD

[4]Lecturer, Department of Zoology AMS ASCW HYD.

## Abstract

*Breastfeeding and adequate complementary feeding are key interventions for improving child survival, potentially saving about 20% of children under five. Breast milk provides nutritive and immunological protection in infants and it helps in growth and development. Some mother offer breast milk in this crucial period due to various misconceptions and cultural beliefs. Our objectives was to Focus on practice of breast feeding among women in various social economic status in urban area of Mansurabad Hyderabad.*

## Key words

**B.F - Breast Feeding, ANC - Antenatal care, S.E.S - Socio Economic Status, WF - Weaning Foods, FTND - Full Term Normal Delivery, LSCS - Lower Segmental Caesarian Section.**

## Introduction

Breast feeding has nutritional, immunological behavioral and economic benefits and also provide desirable mother infant bonding. Despite the demonstrated benefits of breast feeding, breast feeding prevalence and the duration in many countries are still lower than the international recommendation of exclusive breast feeding for the first six months of life. Exclusive breast feeding in the first half year of life and continued breast feeding coupled with appropriate foods reduced the number of children under five die from malnutrition.

Breast feeding is recommended by WHO as key measure to ensure the health of mothers and children. In 2002 WHO Updated the breast feeding guidelines and recommended “all infants should be exclusively breastfed for the first six months of life and receive nutrioally adequate and safe complimentary foods while BF continuously for up to two years of age beyond.

It is now established that the breast feeding practice adopted in terms of duration frequency and exclusiveness is essential for our understanding of impact of breast feeding on complete physical mental and psycho social development of the child.,despite the demonstrated benefits of breast feeding. Breast feeding prevalence and duration in many countries are still lower than the international recommendations of exclusive breast-feeding for the first six months of life (WHO.2002)

In India breast feeding is almost universal. However the rates of early initiation of exclusive breast feeding are far from desirable. The beneficial effects of breast feeding depend on time of breast feeding depend on time of initiation and duration of breast feeding.

Globally less than 40% of infants under the age of six months are exclusively [2] breastfed. Though the ideal time to educate the women about the merits of breast feeding is before pregnancy, few receive counselling during pregnancy and many after failed [5] lactation. This has led to an increased burden on the health care providers to restart breast feeding and managing undernourished newborn. A stronger educational awareness program to prepare the young mothers for a successful lactation will reduce the cost on health care [6] programs. We conducted this study in an urban slum area of Mansurabad.

Aim of the study is to know the breast feeding practices among the urban women and know the SES and mode of delivery of the child.

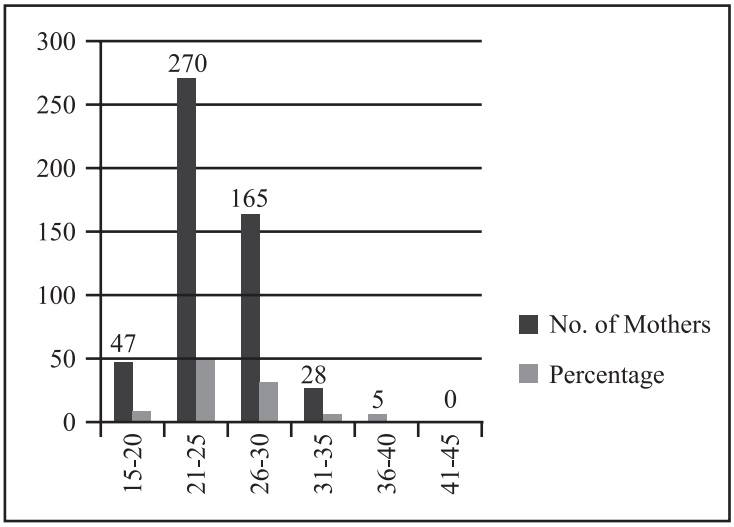
## Methodology

This was a cross sectional study conducted in urban slum area of Mansurabad from May to July 2017. All mothers who are practicing breast feeding attending the outpatient of urban health center in Mansurabad were recruited in the study. Subjects were explained orally about the study and the consent taken. The data collection and educational counselling was done by a single observer. The data was collected by a pre-evaluated questionnaire printed in English or local language. At the end of the interview mothers were given an educational handout about breast feeding. The data was analyzed.

## Results and Discussion

**Table No.1** shows the distribution of study population. (n=515)

| Age group | Number of Mothers | % |
|---|---|---|
| 15-20 | 47 | 9.2 |
| 21-25 | 270 | 52.4 |
| 26-30 | 165 | 32 |
| 31-35 | 28 | 5.5 |
| 36-40 | 5 | 0.9 |
| 41-45 | 0 | 0 |
| **Total** | **515** | **100** |




The study population shows. About 52.4 percent of mothers are in the age group of 21-25 years. and 26- 30 years are about 32%

**Table 2** Socio Economic Status of mothers and mode of birth of a child.

| Socio Economic Status | | FTND |
|---|---|---|
| Class | LSCS | |
| I (69) | 45 (65.2%) | 24 |
| II (183) | 126(68.8%) | 57 |
| III (149) | 86 (57.7%) | 63 |
| IV (113) | 63 (55.7%) | 50 |
| V (1) | 0 | 1 |
| | 320 (62.1%) | 195 (37.9%) |

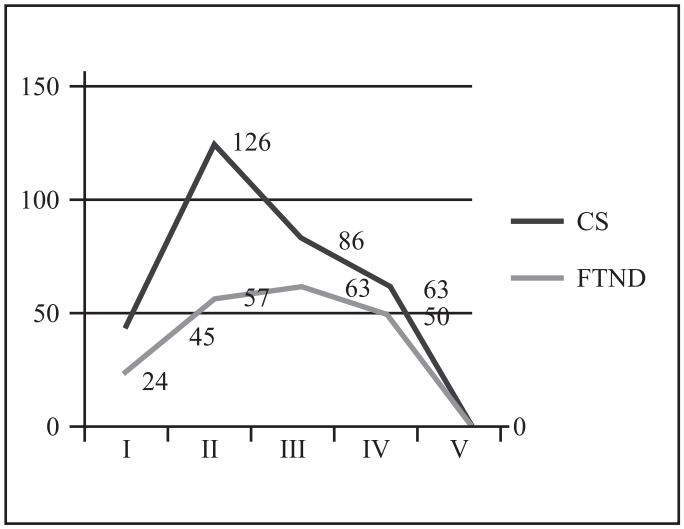
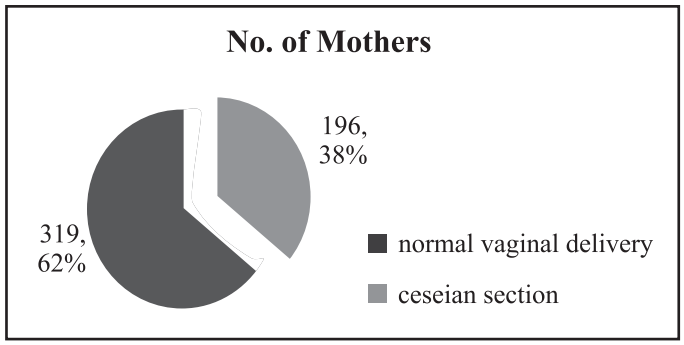



Table 2 shows that the distribution of study population according to the socioeconomic status of the mothers and mode of child birth. Out of 515 mothers about (320) 62% gave the history of Lower Segmental Caesarian Section (LSCS). It is observed that the percentage of LSCS is high more than 50% in all SES status

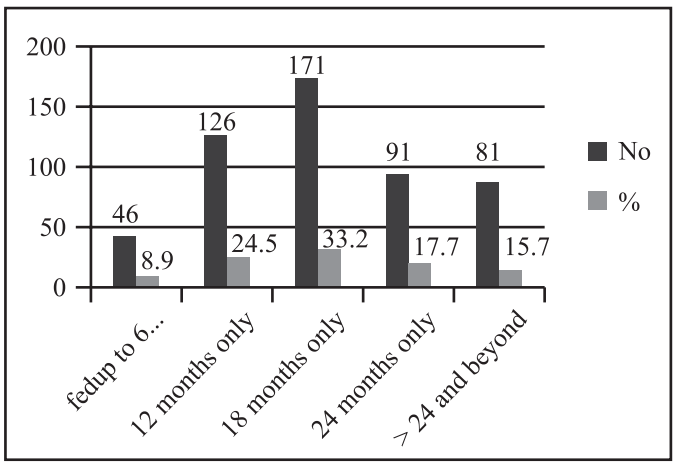
| Table No. 2 Mode of delivery n=515 | | |
|---|---|---|
| Mode of delivery | No. of Mothers | Percentage |
| FTND | 196 | 38% |
| Caesarian Section | 319 | 62% |
| Total delivery | 515 | 100% |




Majority of delivers in urban slum area of Mansurabad shows that they are undergoing LSCS about 62% of mothers and oy 38% are normal vaginal deliveries (FTND)

**Table 3** shows the distribution of mothers according to duration of BF

| Duration of breast feeding given | No. | % |
|---|---|---|
| fed up to 6 months only | 46 | 8.9 |
| 12 months only | 126 | 24.5 |
| 18 months only | 171 | 33.2 |
| 24 months only | 91 | 17.7 |
| > 24 and beyond | 81 | 15.7 |
| **Total** | **515** | **100** |



Majority of the urban slum area mother gave breast feeding 24.5 % up to one year age of the child and 33.2% BF up to the age of one and half year of the age .only 172 of mothers out of 515 breastfed beyond the age of 2 years 33.3%.

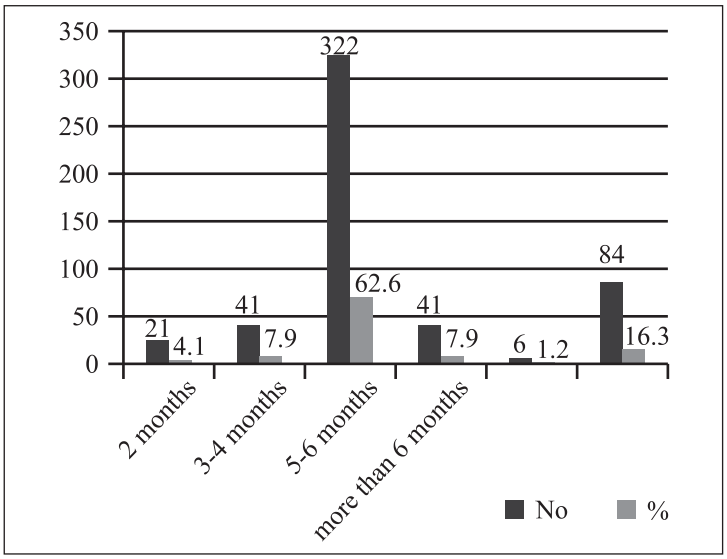
**Table 4** shows the incitation of BF among the mothers

| socio economic status | Inicitation of weaning foods according the age of the child | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Class | 4th month | 5th month | 6th month | 7th month | 8th month | 9th month | 10 months | TOTAL |
| I | 1.4% 1 | 10.1% 7 | 68.1% 47 | 15.9% 11 | 1.4% 1 | 0.0% 0 | 2.8% 2 | 69 |
| II | 3.8% 7 | 9.3% 17 | 61.7% 113 | 13.1% 24 | 4.9% 9 | 2.7% 5 | 4.3% 8 | 183 |
| III | 6.7% 10 | 6.7% 10 | 68.4% 102 | 9.4% 14 | 2% 3 | 2% 3 | 4.6% 7 | 149 |
| IV | 3.5% 4 | 8.8% 10 | 41.6% 47 | 40.7% 46 | 0.0% 0 | 2.65% 3 | 2.65% 3 | 113 |
| V | 0 | 0 | 0.0% 0 | 1 | 0 | 0 | 0 | 1 |
| Total | 22 | 44 | 309 | 96 | 13 | 11 | 20 | 515 |
| % | 4.2 | 8.5 | 60 | 18.6 | 2.5 | 2.1 | 3.8 | 100 |

The weaning foods were initiated 60 percent of mothers whereas as initiation of weanigfoods delayed in class IV socio economic status of mothers.

**Table 5** Practice of breast feeding exclusive among the mothers

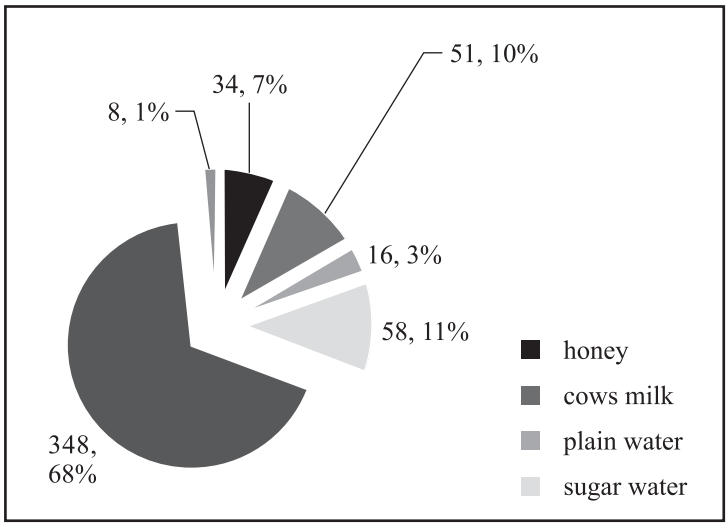
| exclusive breast feeding given upto in months | No. of lactating Mothers | % |
|---|---|---|
| 2 months* | 21 | 4.1 |
| 3-4 months* | 41 | 7.9 |
| 5-6 months | 322 | 62.6 |
| more than 6 months | 41 | 7.9 |
| Ever fed child with breast fed | 6 | 1.2 |
| Child age is less than 6 months | 84 | 16.3 |
| | **515** | **100** |




Exclusive breast feeding was observed only 62.9% of mothers practicing

**Table 6** practice of first feed given to the new born child immediately after the birth

| Table no 6 mothers given the first feed given to the child | | |
|---|---|---|
| **first feed given to the child** | **No.** | **%** |
| Honey | 34 | 6.6 |
| Cow's Milk | 51 | 9.9 |
| Plain Water | 16 | 3.1 |
| Sugar Water | 58 | 11.3 |
| Breast Milk | 348 | 67.6 |
| Powdered Milk | 8 | 1.5 |
| Table no | 515 | 100 |




Breast milk was the about 67% and honey is only 6.6% sugar water about 11.3 %.

## Conclusion

The survey was conducted on mothers (515) in an urban slum area of Mansurabad during the year 2017 (May to July) by the students. The study population is in the age group of 15-40 years. 52% of them are in the age group of 21-25 years. The mode of delivery was 62% of them are under went LSCS and it was very high when compared to normal delivery. Socioeconomic status of mothers shows that only 13.4% are in upper class and upper lower are 22%.

Govt. of Telangana introduced the KCR KIT to encourage the normal deliveries (FTND) and bring down the LSCS which is now around 60-70%. And encourage exclusive breast feeding for 6 months to bring down the infants morbidity and mortality and maternity leave was sanctioned accordingly to six months for first and second pregnancy.

## References

[1] Smith JP, Harvey PJ: Chronic disease and infant nutrition: is it significant to public health. Public Health Nutr 2011;14:279-8

[2] World Health Organisation: www.who.int/features/factfiles/breastfeeding/en/index.html (accessed on 9/9/2012)

[3] Qianling Zhou, Katherine M Younger, John M Kearney: An exploration of the knowledge and attitudes towards breastfeeding among a sample of Chinese mothers in Ireland. BMC Public Health 2010, 10:72

[4] Rajesh Garg, Shyam Sunder, Deepti, Avtar Padda, and Tejbir Singh: Breastfeeding Knowledge and Practices Among Rural Women of Punjab, India: A Community-Based Study. Breastfeeding Medicine: December 2010, 5: 303-307.

[5] Chaturvedi P, Banait N: Knowledge and attitude regarding breastfeeding, in mothers attending antenatal clinics. Indian J Pediatr2000;67:259-62

[6] Thomas M. Ball, MD, MPH, and Anne L. Wright: Health Care Costs of Formula-feeding in the First Year of Life. Pediatrics 1999;103;870

[7] Maheswari Ekambaram, Vishnu Bhat B, Mohamed Asif Padiyath Ahamed: Knowledge, attitiude and practice of breastfeeding among postnatal mothers. Curr Pediatr Res 2010; 14 (2): 119-124

[8] Gunasekaran Dhandapany, Adhisivam Bethou, Arulkumaran Arunagirinathan and Shanthi Ananthakrishnan: Antenatal counselling on breastfeeding – is it adequate A descriptive study from Pondicherry, India. Int Breastfeeding Journal 2008;3:5 doi:10.1186/1746-4358-3

[9] N. Pandit, M. Yeshwanth, Sr. Ida Albuquerque: Factors influencing initiation of breastfeeding in an urban set up. Indian Peditr1994; 31(12):1558-60

[10] I.A. Ekanem, A.P. Ekanem, A. Asuquo, V. O. Eyo: Attitude of working mothers to exclusive breastfeeding in Calabar municipality, Cross River State, Nigeria. Journal of Food Research 2012; 1(No. 2):71

[11] Ali M Al-Binali: Breastfeeding knowledge, attitude and practice among school teachers in Abha female educational district, southwestern Saudi Arabia. International Breastfeeding Journal 2012, 7:10

[12] RN Chaudhary, T Shah, S Raja: Knowledge and practice of mothers regarding breast feeding: a hospital based study. Knowledge & practice in breast feeding 2011; 9 (No.3):194-200

[13] Joshi S, Barakoti B, Lamsal S: Colostrum Feeding: Knowledge, Attitude and Practice in Pregnant Women in a Teaching Hospital in Nepal. International Journal of Medicine and Molecular Medicine 2012;3(8):WMC003601

[14] EYL Leung, KYA Au, SSW Cheng, SY Kok, HK Lui, WCW Wong: Practice of reastfeeding and factors that affect breastfeeding in Hong Kong.Hong Kong Med J 2006;12:432-633

[15] S.S. Hasnin, S.M. Barua, and M.S.Islam: Effects of Education Level of th Father and Mother on perception of breastfeeding. 8 Common wealth Congress on Diarrhoea and Malnutrition; 2006; ICDDR,B,Dhaka, Bangladesh. P.190

# Empowering Women through Physical Education

**Dr. M. Sridevi,** Associate Professor
Department of Physical Education, AMS, Arts & Science College for Women

## Introduction

Regular and enjoyable physical activity benefits everyone. It can improve physical, mental, social and spiritual well-being and for the students and young people everywhere. It should be a part of daily life. Society influences the choices of young people make physical activity, first as it affects all their other choices we all share responsibility for providing good opportunities for physical activity.

Schools and Colleges in particular, play a critical role in fostering young people's physical activity, in teaching the skills and attitudes needed to participate, and in providing a safe venue for the activity to take place. An effective school programme will include time for daily play and structured and unstructured physical activities provide recreation and sport, and other quality physical education for all.

In recent years sport and physical activity as a strategy for the empowerment of girls and women has been gaining recognition worldwide. Women Win is the first International Organization with a sole focus of providing support for innovative sport and physical activity programme for empowerment and creating a social movement around sport for the advancement of women's rights.

Sport and physical activity have not yet been used on a large scale as a strategy within women's movements. There are, however, already very positive stories to tell from both our programme partners and those programmes in network. Based on the experience of these partners we have learned more about how participation in sport and physical activity can empower individual girls and women. The involvement of sport and physical activity can build life skills, confidence and body awareness and may create social networks, which results in dramatic positive life changes for participants. We have also seen that involvement in sport and physical activity can positively change existing gender norms and help girls and women move into public places. Moreover, sport and physical activity programmes provide opportunities to bring communities together and help to realize development objectives relating to such issues as conflict management, reproductive health and gender-based violence.

Empowering girls and women through sport and physical activity is an important assessment and research publication, which focuses on the effect of sport and physical activity programmes on the on the lives of girls and women around the world and how these programmes are developed. Girls and women face a disproportionate number of life challenges, which reduce their ability to achieve full-potential. Recent studies show that despite formal guarantees of equality, the overall

rate of progress for women participants, those from the poorest and most marginalized regions of the world has been slow. Women and girls continue to encounter inequalities and deprivations in their daily lives, which prevent them from contributing towards both the creation of more equitable societies and sustainable development within their communities and beyond. “The State of the World’s Children 2007", a report by the United Nations Children’s fund (UNICEF) asserts that:

“Gender discrimination is pervasive. While the degrees and forms of inequality may vary women and girls are deprived of equal access to resources, opportunities and political power in every region of the world. The oppression of girls and women can include the preference for sons over daughters, limited personal and professional choices for girls and women, the denial of basic human rights and outright gender-based violence.”

Reaching in the period of adolescence is key to confronting these critical issues. Gender-based discrimination, as well as different degrees and forms of inequalities increase for girls during adolescence. As articulated in a report on adolescent girls in the developing world publishing by the Population Council, these girls face new restrictions reserved for women while their male counterparts enjoy new privileges reserved for them, including autonomy, mobility and power. Girls on the other hand are often systematically deprived of the same gains.

Experts agree that sport and physical activity involvement can potentially offer a white range of life benefits for girls and women. The International Platform on Sport and Department, a platform dedicated to the thematic field of sport and development and initiated after the first International Conference on Sport and Development in 2003, underscores or recommend role of sport in promoting gender equity. The platform cites a number of benefits for physically active girls and women. According to the current platform, sport involvement can play a significant role in promoting the physical and mental wellbeing of girls and women fostering opportunities for this leadership and life achievement, initiating social inclusion and social integration of girls and women, and challenging gender norms.

## Women and Empowerment

In my opinion, empowerment is a process by which people gain power over their lives that is empowerment enables women to do things for themselves in their own interests rather than at the command of others for their benefit. Thus empowerment also involves the ability to resist pressures to conform to gender-stereotyped notions concerning presentation and behavior. It also enables women to be more socially assertive. As such becoming empowered enables to become what they do with their lives. David Whitson sees the confident sense of self that comes from being skilled in the use of one’s body as a form of empowerment. The religious or spiritual societies, the World Bank, feminist action group, health and gender researchers’ government United Nations and developmental agencies have all put empowerment on their agenda. The result is multiple meaning and interpretations associated with a variety of strategies. A central element in empowerment is power which is concerned to authority, domination and or exploitation.

The empowerment of women through sport and physical activity has been hit by the fact that sports women being undergoing several physical suffering of various magnitudes. Various opportunities for women’s leadership and capacity building can be achieved through increasing

their participation in sport activities. Evidence from developing countries indicates that some sport and physical activity programmes provides opportunities to women and girls to develop leadership and life skills.

## Importance of Sports for Gender Mainstreaming

Spots are an integral part of the culture of almost every Nation. However its use to promote gender equity and empower girls and women is often overlooked because sport is not universally perceived as a suitable or desirable pursuit for girls and women. Existing social constructs of masculinity and feminist or socially accepted ways of expressing what it means to be a man or women in a particular socio-cultural content play a key role in determining access, levels of participation and benefits from sports.

It is true, in all countries that girls and women are less likely than boys and men to participate in sport and sport continue to be dominated by males. It is a mistake, however to assume that this is because girls and women do not wish to participate in sports and physical activities. Poverty, heavy domestic demands, safety concerns, lack of accessible transpiration, inadequate sport and recreation facilities, and few opportunities for physical education and skills development frequently abstains women's participations in physical activity and sport. Being physically active, leaving home accompanied, or being seen by men outside their family are also additional barriers preventing girls and women from becoming involved in sport and physical activity.

Sport and physical activity can help to reduce the social isolation and exclusion that many girls and women experience particularly those that cannot be attend school and live in poverty. Sport programmes can also provide girls and women with safe places together, help them to build social networks, offer social support and connect them to health, education and employment information services and opportunities that can help to address their marginalization in society.

The country's poor performance on women's empowerment and gender inequality is also reflected in the gender development index. That is India is ranked 132 out of 148 countries on Gender Development Index as per the 2013 Global Human Development Report. Women in India are not encouraged to participate sport and physical activity. The conditions for Indian women in to take-up sports are subpar especially at an International level. The resources to make successful Indian women's teams are readily available, but just need to be utilized. In this content, the Sports Council of India still advocated several policies in favor of sports and environment friendly activities with gender equality. The Council also pays great attention to establish new policies for women empowerment.

## Women and Health Education

Balanced diet and regular physical activity can help to maintain the girls and women healthy. Various research studies showed that regular physical activity may reduces the onset of osteopenia in women. According to the United Nations Population Information Network, the empowerment of and autonomy of women, and improvement in their political, economics and health status are recognized by the International Conference on Population and Development (ICPD) as highly important ends in themselves. In addition, they are seen as essential for the achievement of sustainable development. Education is one of the most important tools of empowering women with the knowledge, skills and self-confidence necessary to participate fully in the development process.

## Safe Spaces

Sport and physical activity programmes provide girls and women with the opportunity to convene in public spaces around a common interest. In this way girls and women are given the chance to assert their independence outside their homes, to build strong social networks and to increase the likelihood of their participation as active citizens with their communities and beyond. Restricting girls from moving beyond the home or area around the home has traditionally functioned as an important safety component. In order to ensure that girls and women enjoy the positive benefits offered by sport and physical activity involvement, participants and their families must feel comfortable and secure to attend regular sport and physical activity practice outside the home area. Addressing safety concerns should be an important priority of all sport and physical activity programmes that seek to empower girls and women.

Safety in this regard means physical safety, meaning that sports and physical activity programmes prioritize the requirement that girls and women are protected from bodily harm in the form of violence, including sexual abuse and preventable sport injuries. This also includes emotional safety, meaning that girls and women feel comfortable and secure in their sport and physical activity, for example, to feel that they can communicate and express themselves. Women need good reliable security for involving in sports. Several sporting events do not provide security for women players or athletes. The women players countenance problems with regarding to boarding, lodging mess, longue etc. The provision for bathrooms sanitation and rest rooms are almost absenting certain sporting events. Girls in India are brought up in increasingly confined, restrictive, enclosed and domestic atmosphere as girls reach adolescence. They are almost barred from taking part in any physical activity. They are restricted to take part in those games and activities which requires them to stay away from home. This preventive tendency makes girls become more homely and confidence level freezes to scale up.

## Role of Government

Women empowerment through sporting involvement can be feasible consideration with the following steps:

- Encouraging sports scholarships in schools for girls
- Ensuring the active participation of various sports organization, clubs authorities in women sporting activities
- Enhancing the quality infrastructure for physical education and women sports
- Ensuring public – private participation in physical education programmes
- Establishing separate women universities for sports and physical education
- Development of corporate sector involved in women sporting activities
- Comprehensive women sports policy framing
- Adequate Budget allocation for women sporting events
- Media coverage policy about women sporting activities
- Scholarship, rewards, honors cash rewards etc. for women

“In fact that country and that Nation which doesn’t respect women will never become great

now and nor will ever in future and in pursuit of making women empower let's work together giving them (women) their much deserved status"

## Conclusion

The gender equity and equality to great extent depend on the mental strength of the people. In this conclusion apart from derived physical and mental well-being enjoyed by physically active girls and women, a well designed sport and physical activity can provide a good platform to enable positive life changes. The involvement of the women in sport will reduce their tension and develop more confidence that will regularly raise their confidence. This situation needs a good background from the state itself. The preventing cultural and social barriers stand as an obstacle in their development scenario. That situation should change. Then the women with their spirit in sports can be regenerated. The safety in sports for women is still an issue which is being tackled with great innovative inputs. If women empowerment needs to take good shape, women should be brought out from their confined restrictive atmosphere and sports can prove an important imperative in empowering women. Government spends lot of money on women empowerment and gender equity programmes. Sport has substantial to empower women both economically and socially. Women are not aware of the values of the sport to their health; hence they are not motivated to venture into sporting at individual level, family level into community level, as result of lack of education. Hegemonic masculinity, lack of education, poverty, lack of media coverage has emerged as the outstanding barriers to women participation in sport both in towns and rural areas. Poverty in women communities has made women inactive in sport.

## Recommendations

- For women to be involved in sport activities there should need for training, establishing separate clubs and advance funding, a responsibility for government.
- Women communities should be encouraged about the economic and social values they gain from sport participation.
- Ministry of Women, gender and empowerment should put a policy that compels a government structures to involve women out of school to do sport and physical activities in their communities.
- Women communities should be encouraged by local and national media to cover every field of sport.
- Sport related programmes should be organized so as to motivate them and expose their talents.

## References

[1] A Haseena V. (2015), The Ways for Women Empowerment through Sports, Journal of Culture, Society and Development, ISSN- 2422-8400, Vol. no. 10, pp. 67-68.

[2] Empowering Women and Promoting Actions for Women's Health.

[3] Women Win Advisory Council (2008), Empowering Girls and Women through Sports and Physical Activity, pp.6-25.

# Challenges and Opportunities of E-Marketing

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## Abstract

*E-Marketing is the process of marketing a brand using the Internet. It includes both direct response marketing and indirect marketing elements and uses a range of technologies to help connect businesses to their customers. E-marketing means using digital technologies to help sell your goods or services. These technologies are a valuable complement to traditional marketing methods whatever the size of your company or your business model. The basics of marketing remain the same – creating a strategy to deliver the right messages to the right people. What has changed is the number of options you have. Though businesses will continue to make use of traditional marketing methods, such as advertising, direct mail and PR, e-marketing adds a whole new element to the marketing mix. Many businesses are producing great results with e-marketing and its flexible and cost-effective nature makes it particularly suitable for small businesses. Very simply put, e-Marketing or electronic marketing refers to the application of marketing principles and techniques via electronic media and more specifically the Internet. The terms e-Marketing, Internet marketing and online marketing, are frequently interchanged, and can often be considered synonymous.*

## Key words

**online marketing, e-marketing, online marketing, Internet marketing, global marketing competition.**

## Introduction

The 1990's was a period of time when more and more noticeable became lowering efficacy of mass marketing approach. Customers got far more demanding, their level of loyalty had significantly dropped, while offering modern, high quality products became not sufficient to stay competitive and succeed in the rapidly globalizing marketplace. According to the report of the Gartner Group from 1996, the most important trends negatively impacting traditional marketing were:

- Less differentiation of products,
- Increasing competition,
- Rising consumer expectations,
- Splintering mass markets

- Diminishing effectiveness of mass media,
- Heightened consumer privacy and security concerns.

Almost at the same time the rapid development of the Internet became a reality. Marketers were among the first who noticed the opportunities arising from this fact and many of them put their strong faith in this new medium. The element especially underlined were interactivity of the new medium and its high potential for building close relationships with customers. In this time there could be found numerous enthusiastic voices about abilities of the new marketing tools or effectiveness of the Internet advertising1. So, at the end of the 90s more and more common became opinions that new marketing era became a fact. According to Postma, this new marketing era can be characterized by three points :

- marketing management according to the information held in marketing databases rather than that acquired through market research and generic models,
- the use of media instead of generic (thematic) advertising to stimulate trade,
- management of personal client relationships as opposed to management of more or less defined target groups.

## Objectives of the Study

1. To identify the forms E-marketing.
2. To know key drivers of e-marketing.
3. To identify the opportunities of e-marketing.
4. To know challenges of e-marketing.

## Need for the Study

When it comes to the success of your business, internet marketing plays a key role. To market yourself and to promote your products and services, you need the support of internet marketing. If you are planning to start a business or you are on your way and want to improve your business you can hire an online marketing agency which takes care of all activities from designing the website for your business to implementing various marketing techniques including Internet marketing. Internet marketing will help you in improving your business brand visibility, traffic and sales.

## Limitations of the study

1. The study has been conducted only by collecting the secondary data.
2. The study focuses on e-commerce market in India.

## Research Methodology

The process used to collect information & data for the purpose of making business decisions. The methodology may include publication research, interview, surveys and other research techniques & could include both present & historical information. The secondary data has used, that has been collected from various articles, journals, books, websites etc. This has been used to study the conceptual framework, definition, present trends and some of the challenges and opportunities of e-commerce in India. All the data included is the secondary base and proper references have been given wherever necessary.

## The advantages of Internet Marketing

1. Offers opportunities for both the individual and the traditional, business owner.
2. Has minimal risk and minimal investment due to its low start-up and operating costs. So, you don't have to commit yourself to expensive overhead.
3. Imagine the possibilities! Set your money making goals to take you from where you are now to where you want to be.
4. When you have your own business, when you are your own boss, you alone, control your future security.

## Key Drivers of Luxury Affiliate for e-Marketing

1. **The evolution of technology**. Improvements in website design and the display of luxury products online allow consumers to more easily search through hundreds of brands and zoom in with amazing clarity to see the specific features of a product, which is significant when you're making more expensive purchases.
2. **Consumer trust**. Over time, luxury consumers have become more comfortable shopping online as the overall site experiences continue to improve. These consumers expect the luxury experience to translate from offline to online to the degree that it can, and demand great customer service and flexible return policies.
3. **Shopping Anytime, Anywhere**. The ubiquity of electronic devices has put more demands on retailers. Consumers now expect to be able to connect with their favourite luxury brands wherever and whenever they want. Luxury retailers and publishers need to work together to make sure the end-to-end shopping experience is optimized for conversion on desktop, iPad and smart phones. If you are not at least measuring the traffic from each of these devices, you are already behind the curve.
4. **The right luxury product at the right price at the right time**. "Discounting, coupons, and deals," are not typically in the lexicon of luxury online retailing, at least not with advertisers. That's not to say that luxury shoppers don't want great value because they do. For them it's about finding the right products, at the right price, at the right time. This makes a publisher's ability to curate products even more important. It's right up there with understanding luxury trends, hot brands, and seasonal patterns. Publishers that fully understand these elements stand to earn the most commissions.
5. **Luxury consumers are citizens of the world**. When you consider the luxury audience of consumers, keep in mind that they live and travel all over the world. When you realize this, you quickly see how luxury online retailing will propel global affiliate marketing. Advertisers with advanced e-commerce capabilities to support multiple currencies and languages, combined with the most flexible shipping and customer service policies, will endear themselves to the luxury shopper. On a related note, publishers also need to consider the geographic source of their traffic when crating products and developing promotional strategies.

## Challenges in E-Marketing

1. **A bad reputation**. A lot of money spent on Internet marketing over the past few years was wasted. Why? One big reason is that the stock market distorted company valuations and

rewarded (or at least failed to penalize) profligate attempts to drive traffic or acquire customers — even if only temporarily. Now e-marketing has a bad reputation. And half-baked metrics such as click-through rates (CTRs) still paint a picture of inefficacy and failure. Plenty of evidence shows that the Web is the most cost-effective branding medium available, but the Net's reputation will need to be rebuilt one success at a time.

2. **Marketing integration**. Most major marketing efforts utilize multiple channels, on- and offline. Email, Web advertising, and viral Internet marketing should serve concrete, measurable objectives as part of an integrated campaign. But coordinating e-marketing with other marketing efforts is an underdeveloped art. Some companies have successfully linked the Net to under-the-cap promotions or to teaser campaigns for new product launches. But all too often the Internet is tacked on at the end of a marketing plan. Determining the Strengths (and weak-nesses) of the Net relative to other channels is a project we all should be working on.

**3.** **E-CRM**. Imagine recognizing the needs of customers as they enter your site. Over time, through implicit and explicit data, you learn about the preferences of each and can serve customers based on their habits, needs, and purchase drivers. You build deep loyalty, and you increase your share of your customers' wallets.

**4.** **Privacy**. Things have quieted down somewhat since Double Click backed away from its plans to merge its online data with offline Abacus data. But the industry's privacy issues have not been sufficiently resolved. Most consumers don't completely trust Web companies and shy away from offering information about them. Companies that collect data responsibly are exposed to misguided regulation that spammers and scammers invite. Sound policy, adopted industry wide, is imperative.

**5.** **Traditional advertising dollars.**
The discrepancy between the amount of time people spend online and the amount top advertisers spend there is enormous. According to a recent Morgan Stanley Dean Witter report, the top six advertisers spend less than one percent of their advertising dollars on the Web. With dot-com ad spending in decline, attracting traditional advertisers (mainly by addressing the four issues above) is the key to the industry's growth.

6. **E-mail** Address Churning As the giants of the Internet continue to scrap it out, a number of new e-mail projects have been launched to help build and maintain online loyalty.
Facebook announced its vision for the future of messaging for its 500 million users. Not to be outdone, AOL has announced that it will allow for new and more personalized domains and addresses. It will be very tempting to get rid of that clunky stevstrhay99 user name many of us have been saddled with for years. We might expect to see a lot of customers on the move and changing their primary e-mail addresses over the next few months, potentially cutting us off. Initiatives and incentives to keep e-mail addresses and profiles up to date will be critical. The trick is to keep the issue top of mind with customers and make it easy for them to update their profiles.

**7.** **New Layer of E-mail Filtering** Gmail's Priority Inbox and Facebook's Social Inbox may result in mail ending up in folders that are rarely reviewed. This potentially has a knock on effect on our opening rates and other performance metrics. Ironically, it is those same metrics that will help us here. We will need to work harder to ensure that our customer is opening,

clicking, sharing, and forwarding our e-mails; this helps with complex relevancy scoring that will ensure the message finds its way into a higher priority destination. It spells the end of the one-way communication and opens up some exciting opportunities for on message interaction with customers.

8. **Increased Integration with Social Networks** Love them or hate them, many of our customers are almost permanently active on social networks. E-mail Must be equipped for instant integration; sharing, liking, posting, and linking. This is a huge benefit for the brand, getting exposure and endorsements from trusted friends. We must ensure we are making it easy, from a design and technology point of view, to facilitate this. With all the extra exposure we will get, we must make it easy to engage all these new contacts we will meet as a result.
9. **Trigger-Based E-mail** "Right message, right person, right time" has been a maxim of the direct marketing industry for years. The challenge is that "right time" now might be a window of perhaps two minutes. In time, the role of trigger-based e-mail that can engage and interact after a specific action, perhaps reviewing a promotional Web page, will be increasingly critical. There are obviously performance and revenue benefits here, but managing privacy concerns will be critical. Customers don't want to feel that we are stalking and spying on them. Once we have checked off the customer's preferences, we want to surprise and delight them with our ability to anticipate their needs.
10. **Mobile** these columns are full of stories on the explosive growth of mobile devices on which our e-mails are increasingly being served up. Feedback from one client recently suggested that 49 percent of customers would prefer to read news and offers on a mobile phone. This one cannot wait. Are your messages able to detect and render based on the operating system they arrive at? Are you writing your copy and treating images for readability and performance over a mobile? It could just make or break a campaign. All that remains is to wish you a happy and successful New Year. Here's hoping that your preferred brand of mobile, smart phone or tablet is in your New Year resolutions and that your campaigns in 2011 continue to perform for you and delight your customers

## Findings

1. The study indicates that e-commerce sector has huge growth potential in India.
2. Internet is the back-bone of e-commerce. But internet penetration in India is low compared to other countries.
3. The growth of mobile internet is encouraging.
4. There are some obstacles responsible for slow growth of e-commerce in India.

## Conclusion

It is filled with many complicated challenges that can put you off track, confuse you, and prevent you from succeeding. Reports and eBooks that attempt to give you a one-size-fits-all approach tend to miss a very important point; successful internet marketing requires to be a dynamic, intelligent, and flexible. So a set of static, unchangeable plans is unlikely to make you successful. That is exactly why this blog was drafted. Instead of giving you a paint-by-numbers approach, I've given you a set of rules that will provide you with a firm, workable framework within which

you can build a successful business. At the same time, these rules will leave you with the flexibility to remain responsive and to come up with dynamic responses to dynamic problems.

## Bibliography

http://www.indianmba.com/Faculty_Column/FC822/fc822.html

http://searchcio.techtarget.com/definition/e-commerce

http://www.investorwords.com/1637/e_commerce.html

https://en.wikipedia.org/wiki/E-commerce_in_India

https://sokrati.com/blog/current-trends-about-indian-e-commerce-industry/

https://www.linkedin.com/pulse/e-commerce-india-scope-challenges-future-shantanu-gaur

www.slideshare.net/.../research-paper-on-ecommerce-challenges-and-opportunities

# Application of Differential Equations in Various Fields

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A **differential equation** is a Mathematical equation that relates some function with its derivatives. In applications, the functions usually represent physical quantities, the derivatives represent their rates of change, and the equation defines a relationship between the two. Because such relations are extremely common, differential equations play a prominent role in many disciplines including engineering, physics, economics, and biology.

In pure mathematics, differential equations are studied from several different perspectives, mostly concerned with their solutions — the set of functions that satisfy the equation. Only the simplest differential equations are solvable by explicit formulas; however, some properties of solutions of a given differential equation may be determined without finding their exact form.

If a self-contained formula for the solution is not available, the solution may be numerically approximated using computers. The theory of dynamical systems puts emphasis on qualitative analysis of systems described by differential equations, while many numerical methods have been developed to determine solutions with a given degree of accuracy.

Visualization of heat transfer in a pump casing, created by solving the heat equation. (The **heat equation** is a parabolic partial differential equation that describes the distribution of heat (or variation in temperature) in a given region over time). Heat is being generated internally in the casing and being cooled at the boundary, providing a steady state temperature distribution.

## History

Differential equations first came into existence with the invention of calculus by Newton and Leibniz. Isaac Newton listed three kinds of differential equations:

$$\frac{dy}{dx} = f(x)$$

$$\frac{dy}{dx} = f(x, y)$$

$$x_1 \frac{\partial y}{\partial x_1} + x_2 \frac{\partial y}{\partial x_2} = y$$

He solves these examples and others using infinite series and discusses the non-uniqueness of solutions.

Jacob Bernoulli proposed the Bernoulli differential equation in 1695. This is an ordinary differential equation of the form

$y + P(x)\, y = Q(x)\, y^n$ for which the following year Leibniz obtained solutions by simplifying it.

Historically, the problem of a vibrating string such as that of a musical instrument was studied by Jean le Rondd'Alembert, Leonhard Euler, Daniel Bernoulli, and Joseph-Louis Lagrange. In 1746, d'Alembert discovered the one-dimensional wave equation, and within ten years Euler discovered the three-dimensional wave equation.

The Euler–Lagrange equation was developed in the 1750s by Euler and Lagrange in connection with their studies of the tautochrone problem. This is the problem of determining a curve on which a weighted particle will fall to a fixed point in a fixed amount of time, independent of the starting point.

Lagrange solved this problem in 1755 and sent the solution to Euler. Both further developed Lagrange's method and applied it to mechanics, which led to the formulation of Lagrangian mechanics.

Fourier published his work on heat flow in Théorieanalytique de la chaleur (The Analytic Theory of Heat in which he based his reasoning on Newton's law of cooling, namely, that the flow of heat between two adjacent molecules is proportional to the extremely small difference of their temperatures. Contained in this book was Fourier's proposal of his heat equation for conductive diffusion of heat. This partial differential equation is now taught to every student of mathematical physics.

## Example

For example, in classical mechanics, the motion of a body is described by its position and velocity as the time value varies. Newton's laws allow (given the position, velocity, acceleration and various forces acting on the body) one to express these variables dynamically as a differential equation for the unknown position of the body as a function of time.

In some cases, this differential equation (called an equation of motion) may be solved explicitly.

An example of modelling a real world problem using differential equations is the determination of the velocity of a ball falling through the air, considering only gravity and air resistance. The ball's acceleration towards the ground is the acceleration due to gravity minus the acceleration due to air resistance. Gravity is considered constant, and air resistance may be modelled as proportional to the ball's velocity. This means that the ball's acceleration, which is a derivative of its velocity, depends on the velocity (and the velocity depends on time). Finding the velocity as a function of time involves solving a differential equation and verifying its validity.

## Types

Differential equations can be divided into several types. Apart from describing the properties of the equation itself, these classes of differential equations can help inform the choice of approach to a solution. Commonly used distinctions include whether the equation is: Ordinary/Partial, Linear/ Non-linear, and Homogeneous/Inhomogeneous. This list is far from exhaustive; there are many other properties and subclasses of differential equations which can be very useful in specific contexts.

- Inhomogeneous first-order linear constant coefficient ordinary differential equation:

$$\frac{du}{dx} = cu + x^2.$$

- Homogeneous second-order linear ordinary differential equation:

$$\frac{d^2u}{dx^2} - x\frac{du}{dx} + u = 0.$$

- Homogeneous second-order linear constant coefficient ordinary differential equation describing the harmonic oscillator:

$$\frac{d^2u}{dx^2} + \omega^2 u = 0.$$

- Inhomogeneous first-order nonlinear ordinary differential equation:

$$\frac{du}{dx} = u^2 + 4.$$

- Second-order nonlinear (due to sine function) ordinary differential equation describing the motion of a pendulum of length *L*:

$$L\frac{d^2u}{dx^2} + g\sin u = 0.$$

In the next group of examples, the unknown function *u* depends on two variables *x* and *t* or *x* and *y*.

- Homogeneous first-order linear partial differential equation:

$$\frac{\partial u}{\partial t} + t\frac{\partial u}{\partial x} = 0.$$

Solving differential equations is not like solving algebraic equations. Not only are their solutions often unclear, but whether solutions are unique or exist at all are also notable subjects of interest.

A delay differential equation (DDE) is an equation for a function of a single variable, usually called **time**, in which the derivative of the function at a certain time is given in terms of the values of the function at earlier times.

A stochastic differential equation (SDE) is an equation in which the unknown quantity is a stochastic process and the equation involves some known stochastic processes, for example, the Wiener process in the case of diffusion equations. Differential (DAE) is a differential equation comprising differential and algebraic terms, given in implicit form.

The theory of differential equations is closely related to the theory of difference equations, in which the coordinates assume only discrete values, and the relationship involves values of the unknown function or functions and values at nearby coordinates. Many methods to compute numerical solutions of differential equations or study the properties of differential equations involve approximation of the solution of a differential equation by the solution of a corresponding difference equation.

## Applications

The study of differential equations is a wide field in pure and applied mathematics, physics, and engineering. All of these disciplines are concerned with the properties of differential equations of various types. Pure mathematics focuses on the existence and uniqueness of solutions, while applied mathematics emphasizes the rigorous justification of the methods for approximating solutions. Differential equations play an important role in modelling virtually every physical, technical, or biological process, from celestial motion, to bridge design, to interactions between neurons. Differential equations such as those used to solve real-life problems may not necessarily be directly solvable, i.e. do not have closed form solutions. Instead, solutions can be approximated using numerical methods.

Many fundamental laws of physics and chemistry can be formulated as differential equations. In biology and economics, differential equations are used to model the behavior of complex systems. The mathematical theory of differential equations first developed together with the sciences where the equations had originated and where the results found application. However, diverse problems, sometimes originating in quite distinct scientific fields, may give rise to identical differential equations. Whenever this happens, mathematical theory behind the equations can be viewed as a unifying principle behind diverse phenomena. As an example, consider propagation of light and sound in the atmosphere and of waves on the surface of a pond. All of them may be described by the same second-order partial differential equation, the wave equation, which allows us to think of light and sound as forms of waves, much like familiar waves in the water. Conduction of heat, the theory of which was developed by Joseph Fourier, is governed by another second-order partial differential equation, the heat equation. It turns out that many diffusion processes, while seemingly different, are described by the same equation; the Black–Scholes equation in finance is, for instance, related to the heat equation.

## 1.Physics

### ➤ Euler–Lagrange equation in classical mechanics

**Lagrangian mechanics** is a reformulation of classical mechanics, introduced by the Italian-French mathematician and astronomer Joseph-Louis Lagrange in 1788.

In Lagrangian mechanics, the trajectory of a system of particles is derived by solving the Lagrange equations in one of two forms, either the Lagrange equations of the first kind, which treat constraints explicitly as extra equations, often using Lagrange multipliers; or the Lagrange equations of the second kind, which incorporate the constraints directly by judicious choice of generalized coordinates. In each case, a mathematical function called the **Lagrangian** is a function of the generalized coordinates, their time derivatives, and time, and contains the information about the dynamics of the system.

### ➤ Hamilton's equations in Classical Mechanics

**Hamiltonian Mechanics** is a theory developed as a reformulation of classical mechanics and predicts the same outcomes as non-Hamiltonian classical mechanics. It uses a different mathematical formalism, providing a more abstract understanding of the theory. Historically, it was an important reformulation of classical mechanics, which later contributed to the formulation of statistical mechanics and quantum mechanics. Hamiltonian mechanics was first formulated by William Rowan Hamilton in 1833, starting from Lagrangian mechanics, a previous reformulation of classical mechanics introduced by Joseph Louis Lagrange in 1788.

### ➤ Radioactive Decay in Nuclear Physics

Newton's law of **Radioactive decay** (also known as **nuclear decay** or **radioactivity**) is the process by which an unstable atomic nucleus loses energy (in terms of mass in its rest frame) by emitting radiation, such as an alpha particle, beta particle with neutrino or only a neutrino in the case of electron capture, gamma ray, or electron in the case of internal conversion. A material containing such unstable nuclei is considered **radioactive**. Certain highly excited short-lived nuclear states can decay throughneutron emission, or more rarely, proton emiscooling in thermodynamics.

➤ **The Wave Equation**

The **wave equation** is an important second-order linear partial differential equation for the description of waves — as they occur in classical physics — such as sound waves, light waves and water waves. It arises in fields like acoustics, electromagnetics, and fluid dynamics.

➤ **Laplace's equation, which defines harmonic functions**

In mathematics, **Laplace's equation** is a second-order partial differential equation named after Pierre-Simon Laplace who first studied its properties. This is often written as:

$$\nabla^2 \varphi = 0 \qquad \text{or} \qquad \Delta \varphi = 0$$

the Laplace operator and φ is a scalar function.

Laplace's equation and Poisson's equation are the simplest examples of elliptic partial differential equations. The general theory of solutions to Laplace's equation is known as potential theory. The solutions of Laplace's equation are the harmonic functions, which are important in many fields of science, notably the fields of electromagnetism, astronomy, and fluid dynamics, because they can be used to accurately describe the behavior of electric, gravitational, and fluid potentials. In the study of heat conduction, the Laplace equation is the steady-state heat equation.

➤ **Poisson's Equation**

In mathematics, **Poisson's equation** is a partial differential equation of elliptic type with broad utility in mechanical engineering and theoretical physics. It arises, for instance, to describe the potential field caused by a given charge or mass density distribution; with the potential field known, one can then calculate gravitational or electrostatic field. It is a generalization of Laplace's equation, which is also frequently seen in physics. The equation is named after the Frenchmathematician, geometer, and physicist Siméon Denis Poisson.

➤ **Classical Mechanics**

So long as the force acting on a particle is known, Newton's second law is sufficient to describe the motion of a particle. Once independent relations for each force acting on a particle are available, they can be substituted into Newton's second law to obtain an ordinary differential equation, which is called the equation of motion.

➤ **Electrodynamics**

Maxwell's equations are a set of partial differential equations that, together with the Lorentz force law, form the foundation of classical electrodynamics, classical optics, and electric circuits. These fields in turn underlie modern electrical and communications technologies. Maxwell's equations describe how electric and magnetic fields are generated and altered by each other and by charges and currents. They are named after the Scottish physicist and mathematician James Clerk Maxwell, who published an early form of those equations between 1861 and 1862.

➤ **General relativity**

The Einstein field equations (EFE; also known as "Einstein's equations") are a set of ten partial differential equations in Albert Einstein's general theory of relativity which describe the fundamental interaction of gravitation as a result of space time being curved by matter and energy. First published by Einstein in 1915 as a tensor equation, the EFE equate local space time curvature

(expressed by the Einstein tensor) with the local energy and momentum within that spacetime (expressed by the stress–energy tensor).

➤ **Quantum mechanics**

In quantum mechanics, the analogue of Newton's law is Schrödinger's equation (a partial differential equation) for a quantum system (usually atoms, molecules, and subatomic particles whether free, bound, or localized). It is not a simple algebraic equation, but in general a linearpartial differential equation, describing the time-evolution of the system's wave function (also called a "state function").

## 2. Biology

➤ **Verhulst equation – biological population growth**

The growth or decay of population of a single species interacting with a large number of other species (or environment) according to the Volterra-Lotka model is investigated. When the environment is initially very close to its equilibrium level, the growth of a single species follows a generalized Verhulst law, containing hereditary effects. When growth starts at a level much below equilibrium, the population first overshoots equilibrium and then approaches it. When decay starts at a level much higher than equilibrium, the population first decays precipitously to a very low level and then slowly grows toward equilibrium.

Verhulst model The Verhulst model is defined as follows. Let $N_o(t)$ be the population of a single species (labeled by the subscript 0) at time t, and let $Q_o$ be the equilibrium population of that species. Then Verhulst's equation of motion is $(d/dt)N_o = -kN_o(N_o - Q_o)$ where k is a rate constant. The main result of this article is a generalization of Equation to include hereditary and noise effects.

➤ **Replicator dynamics – found in theoretical biology**

In mathematics, the replicator equation is a deterministic monotone non-linear and non-innovative game dynamic used inevolutionary game theory. The replicator equation differs from other equations used to model replication, such as the quasispecies equation, in that it allows the fitness function to incorporate the distribution of the population types rather than setting the fitness of a particular type constant. This important property allows the replicator equation to capture the essence of selection. Unlike the quasispecies equation, the replicator equation does not incorporate mutation and so is not able to innovate new types or pure strategies

➤ **Hodgkin–Huxley model – neural action potentials**

The **Hodgkin–Huxley model**, or **conductance-based model**, is a mathematical model that describes how action potentials in neurons are initiated and propagated. It is a set of nonlinear differential equations that approximates the electrical characteristics of excitable cells such as neurons and cardiac myocytes, and hence it is a continuous time model, unlike theRulkov map for example

➤ **Predator-prey equations**

The Lotka–Volterra equations, also known as the predator–prey equations, are a pair of first order, non-linear, differential equations frequently used to describe the population dynamics of two species that interact, one as a predator and the other as prey.

## 3. Chemistry

The rate law or rate equation for a chemical reaction is a differential equation that links the reaction rate with concentrations or pressures of reactants and constant parameters (normally rate coefficients and partial reaction orders). To determine the rate equation for a particular system one combines the reaction rate with a mass balance for the system. In addition, a range of differential equations are present in the study of thermodynamics and quantum mechanics.

## 4. Economics

The key equation of the Solow–Swan model is

$$\frac{\partial k(t)}{\partial t} = s[k(t)]^{\alpha} - \delta k(t)$$

The Black–Scholes PDE

### ➢ Malthusian Growth Model

A Malthusian growth model, sometimes called a simple exponential growth model, is essentially growth based on a constant rate. The model is named after Thomas Robert Malthus, who wrote *An Essay on the Principle of Population* (1798), one of the earliest and most influential books on population

Malthusian models have the following form:

$$P(t) = P_0 e^{rt}$$

where

- $P_0 = P(0)$ is the initial population size,
- $r$ = the population growth rate, sometimes called *Malthusian parameter*,
- $t$ = time.

This model is often referred to as the *exponential law*. It is widely regarded in the field of population ecology as the first principle of population dynamics, with Malthus as the founder. The exponential law is therefore also sometimes referred to as the *Malthusian Law*. By now, it is a widely accepted view to analogize Malthusian growth in Ecology to Newton's First Law of uniform motion in physics.

- Malthus wrote that all life forms, including humans, have a propensity to exponential population growth when resources are abundant but that actual growth is limited by available resources:
- Through the animal and vegetable kingdoms, nature has scattered the seeds of life abroad with the most profuse and liberal hand.... The germs of existence contained in this spot of earth, with ample food, and ample room to expand in, would fill millions of worlds in the course of a few thousand years. Necessity, that imperious all pervading law of nature, restrains them within the prescribed bounds. The race of plants, and the race of animals shrink under this great restrictive law. And the race of man cannot, by any efforts of reason, escape from it. Among plants and animals its effects are waste of seed, sickness, and premature death. Among mankind, misery and vice.

### ➤ The Vidale–Wolfe Advertising Model

This paper considers an optimal-control problem for the dynamics of the Vidale-Wolfe advertising model, the optimal control being the rate of advertising expenditure to achieve a terminal market share within specified limits in a way that maximizes the present value of net profit streams over a finite horizon. First, the special polar cases of fixed and free end points are solved with and without an upper limit on advertising rate. The complete solution to the general problem is then constructed from these polar cases. The fixed-end-point case with no upper limit on the advertising rate is solved by using Green's theorem, while the other cases require additional use of switching-point analysis based on the maximum principle. The optimal control is characterized by a combination of bang-bang, impulse, and singular control, with the singular arc forming a turnpike.

## References


[1] Newton, Isaac. (c.1671). MethodusFluxionumetSerierumInfinitarum (The Method of Fluxions and Infinite Series), published in 1736 [Opuscula, 1744, Vol. I. p. 66].

[2] Bernoulli, Jacob *(1695), "Explicationes, Annotationes&Additiones ad ea, quae in Actis sup. de CurvaElastica, IsochronaParacentrica, &Velaria, hincindememorata, &paratimcontroversalegundur; ubi de Linea mediarumdirectionum, alliisquenovis",* ActaEruditorum

[3] *Cannon, John T.; Dostrovsky, Sigalia (1981). "The evolution of dynamics, vibration theory from 1687 to 1742". Studies in the History of Mathematics and Physical Sciences.* ***6****. New York: Springer-Verlag: ix + 184 pp.*ISBN 0-3879-0626-6*.GRAY, JW (July 1983). "BOOK REVIEWS". Bulletin (New Series) of the American Mathematical Society.* ***9*** *(1).* (retrieved 13 Nov 2012).

[4] *Wheeler, Gerard F.; Crummett, William P. (1987). "The Vibrating String Controversy".* Am. J. Phys.***55*** *(1): 33–37.* Bibcode*:*1987AmJPh..55...33W. doi*:*10.1119/1.15311.

[5] For a special collection of the 9 groundbreaking papers by the three authors, see First Appearance of the wave equation: D'Alembert, Leonhard Euler, Daniel Bernoulli. - the controversy about vibrating strings (retrieved 13 Nov 2012). Herman HJ Lynge and Son.

[6] For de Lagrange's contributions to the acoustic wave equation, can consult Acoustics: An Introduction to Its Physical Principles and Applications Allan D. Pierce, Acoustical Soc of America, 1989; page 18.(retrieved 9 Dec 2012)

[7] Speiser, David. Discovering the Principles of Mechanics 1600-1800, p. 191 (Basel: Birkhäuser, 2008).

[8] *Fourier, Joseph (1822).* Théorieanalytique de la chaleur *(in French). Paris: FirminDidotPèreetFils.* OCLC 2688081.

*[9] Boyce, William E.; DiPrima, Richard C. (1967). Elementary Differential Equations and Boundary Value Problems (4th ed.). John Wiley & Sons. p. 3.*

[10] Weisstein, Eric W. "Ordinary Differential Equation Order."From MathWorld-A Wolfra WebResource. http://mathworld.wolfram.com/OrdinaryDifferentialEquationOrder.html

[11] Order and degree of a differential equation, accessed Dec 2015.

[12] *Zill, Dennis G. A First Course in Differential Equations (5th ed.). Brooks/Cole.* ISBN 0-534-37388-7.

[13] *Einstein, Albert (1916).* "The Foundation of the General Theory of Relativity". Annalen der Physik. ***354*** *(7): 769.* Bibcode*:*1916AnP...354..769E. doi*:*10.1002/andp.19163540702. *Archived from* the original*(*PDF*) on 2006-08-29.*

[14] Einstein, Albert *(November 25, 1915).* "Die Feldgleichungen der Gravitation". *Sitzungsberichte der PreussischenAkademie der Wissenschaftenzu Berlin: 844–847*. Retrieved 2006-09-12.

[15] Misner, Charles W.*;* Thorne, Kip S.*;* Wheeler, John Archibald *(1973).* Gravitation. *San Francisco:* W. H. Freeman. ISBN 978-0-7167-0344-0 Chapter 34, p. 916.

[16] *Griffiths, David J. (2004), Introduction to Quantum Mechanics (2nd ed.), Prentice Hall, pp. 1–2,* ISBN 0-13-111892-7

[17] IUPAC Gold Book definition of rate law. See also: According to IUPACCompendium of Chemical Terminology.

[18] Kenneth A. Connors Chemical Kinetics, the study of reaction rates in solution, 1991, VCH Publishers.

# Nanotechnology in Cancer Therapy

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***Abstract***

*Cancer is one of the major causes of mortality worldwide and advanced techniques for therapy are urgently needed. The development of novel nanomaterials and nanocarriers has allowed a major drive to improve drug delivery in cancer. The major aim of most nanocarrier applications has been to protect the drug from rapid degradation after systemic delivery and allowing it to reach tumor site at therapeutic concentrations, meanwhile avoiding drug delivery to normal sites as much as possible to reduce adverse effect. These nanocarriers are formulated to deliver drugs either by passive targeting, taking advantage of leaky tumor vasculature or by active targeting using ligands that increase tumoral uptake potentially resulting in enhanced antitumor efficacy, thus achieving a net improvement in therapeutic index. The rational design of nanoparticles plays a critical role since structural and physical characteristic. In this review, we focus on several novel and improved strategies innanocarrier design for cancer therapy*

**Key words**

**nanoparticles, nanomedicine, drug delivery, cancer therapy**

## Introduction

Cancer is one of the leading causes of morbidity and mortality worldwide and it is expected to be the major cause of death in the coming decades [1]. Despite the advances and extensive research on approaches and research still limited to surgery, radiotherapy, chemotherapy, immuno-therapy. The use of nanotechnology in cancer treatment offers some exciting possibilities, including the possibility of destroying cancer tumors with minimal damage to healthy tissue and organs, as well as the detection and elimination of cancer cells before they form tumors. Treatment failure is related to either drug resistant, pharmacological or toxicity issues in most instances. Most efforts to improve cancer treatment through nanotechnology are at the research or development stage. However, the effort to make these treatments a reality is highly focused. It is possible that these efforts will result in cancer becoming nearly eliminated in a decade or so, in the same way that vaccines nearly eliminated small pox in the last century. Taken together, biomaterials and nano-technology offer a unique opportunity to improve survival in cancer patients. In this review, we will focus on strategies of nanoparticle design and highlight the latest developments in cancer nanomedicine.

## METHODS

### Nanoparticles

The history of nanoparticles starts in 1950s with a polymer-drug conjugate that was designed by Jatzkewitz [2], followed by Bangham who discovered the liposomes in mid-1960s (3),. In 1972, Scheffel and colleagues first reported albumin based nanoparticle(4), with which formed the basis of albumin-bound paclitaxel (Abraxane). Abraxanewas approved in 2005 by US food and drug Administration (FDA) for the treatment of breast cancer (5) and recently approved for the treatment of lung cancer (6). Despite the advantages of passive targeting approaches, several limitations exist that still needs to be eliminated in the future.Certain tumors are difficult to deliver due to lack of Enhanced Permeability and retention(EPR) effect, hence permeability in blood vessels may not be identical throughout the same tumor (7). To overcome these limitations, nanoparticles are designed to bind to specific sites or targets through the ligands that recognize particular receptors in target cells.

### Active Targeting

Various receptors on the tumor cell surface have have been studied as potential sites to achieve selective delivery. Nanoparticle surface can be modified by variety of conjuation chemistries to attach specific receptor ligands (8). Nanoparticles recognize and bind to their targets with sunsequent uptake through receptors mediated endocytosis. Once internalization, the drug is realsed in cytoplasm or nucleus.Such receptors ligands may be peptides, vitamins, antibodies, carbohydrates, and other chemical structures. For instance, the overexpression of transferring and folate in certain tumors have been exploited to deliver nanoparticles conjugated with these receptors ligands (9) (10).

Another example is the Alpha-v beta3 integrin,which is overexpressed in a wide range of tumors and angiogenic tumor-associated endothelium,and is largely absent in normal tissues. Han and colleagues have recently reported that the administration of chitosan nanoparticles conjugated with cyclic Arg-Gly-Asp (RGD) led to increased tumor delivery and enhanced anti-tumor activity in ovarian cancer models [11] (Fig. 1). A variety of targeting agents such as monoclonal antibodies (mAbs) and nucleic acids (aptamers) are also used to enhance tumoral uptake of nanoparticles. Using mAbs for targeting in cancer therapy first described by Milstein in 1981 (12). Since then,antibody-based targeting has made a significant progression as a feasible strategy in cancer therapy.

## DRUG DELIVERY SYSTEMS

### Liposmes

Liposomes are self-assembling nanopracticle formed by dispersion of phospholipids with hydrophilic heads and hydrophobic anionic/cationic long chain tails,creating closed membrane structures. (Fig.2) Hydrophilic agents such as drugs as siRNA or hydrophobic drugs can be incorporated into the inner compartments and, into the hydrophobic membranes respectively. Currently, several liposomal anticancer drugs are used successful as carriers in the clinical trials. For instance, Doxorubicin loaded liposomes were modified with polythene glycol (PEG) that alters the plasma pharmacokinetics and tissue distribution of doxorubicinnand this PEGylated liposomal doxorubicin (doxil) carriers,were approved by FDA for the treatment of kaposi’s sarcoma (13). Along with Doxil, approved by liposomal formulation include non-pegylated liposomal doxorubicin, liposomal daunorubicin, liposomal amphotericin B, liposomal cisplatin.

## Characteristics of Nanoparticles

Physical and chemical characteristics of nanoparticle including size, charge, shape play individually play major roles for vivo biodistribution and cellular internalization of these drug carriers. In this section, we will focus on lifetime delivery of the nanoparticle.

### Size

Particle size is one of the crucial primary factors in determining the circulation time of the nanoparticles. After systemic administration, nanoparticles accumulate in spleen due to mechanical filtration and removed by reticulo-endothelial system (RES). For example, as the main constituents of RES, kupffer cells play a major role for removal of the particles accumulated in the liver (14). Currently, 100-200 nm is accepted as optimal size for drug delivery systems since nanocarriers take the advantage of EPR effect in tumors and avoid filtration in the spleen whereas they are large enough to avoid the uptake in the liver(15) .Particles with a smaller diameter than 5nm are rapidly cleared from blood circulation through renal clearance or extravasation (16) (17) (18). However, particles with size upto 15 micrometer, accumulate in liver, spleen and bone marrow (19). In addition, recent studies show that the geometry of the particles in an important as size range in terms of cellular internalization and distribution. As a result, accumulating evidence shows that although sizeis major parameter in the design of nanocarriers for decades, the shape as well, has high impact along with the size.

### Shape

Degradation properties of nanoparticles and subsequent payload release have been shown to be dependent on particle shape (20). The importance of surface area and diameter were also demonstrated to be critical for cellular uptake of the nanoparticles (21). Hemi-shperical particles were generated as sustained release devices in order to achieve zero-order. Spherical particles, however, can provide different degradation profiles as their shapes are susceptible upon degradation (22). Additionally, deformability of spherical nanoparticles is also playing a key role to avoid spleen filtration since spleen exhibit asymmetric filtering units(23). Therefore, nanoparticles which are especially larger then 200nm should be either deformable enough to bypass the filtration in spleen or flexible as erythrocytes that can avoid filtration even with 10 micrometer diameter. This study elucidated the importance of shape properties of nanoparticles in addition to size distribution, indicating that geometry of the nanoparticles contributes to oponization, in vivo biodistribution, the strength of adhesion and internalization rate the cells (24).

## Result and Discussion

The result of nanotechnology extends from its medical, ethical, mental, legal, and environmental applications, to fields such as biology, chemistry, computing, material science and communications. Nanotechnology is a boon in cancer therapy because they are active targeting and they go and bind to their targets with subsequent uptake through receptors mediated endocytosis, Once internalization the drug is released in cytoplasm or nucleus. Nanotechnology's reduced size may allow for automation of task's which were previously inaccessible due to physical restriction, which in turn may reduce labor, land, or maintenance requirements placed on humans

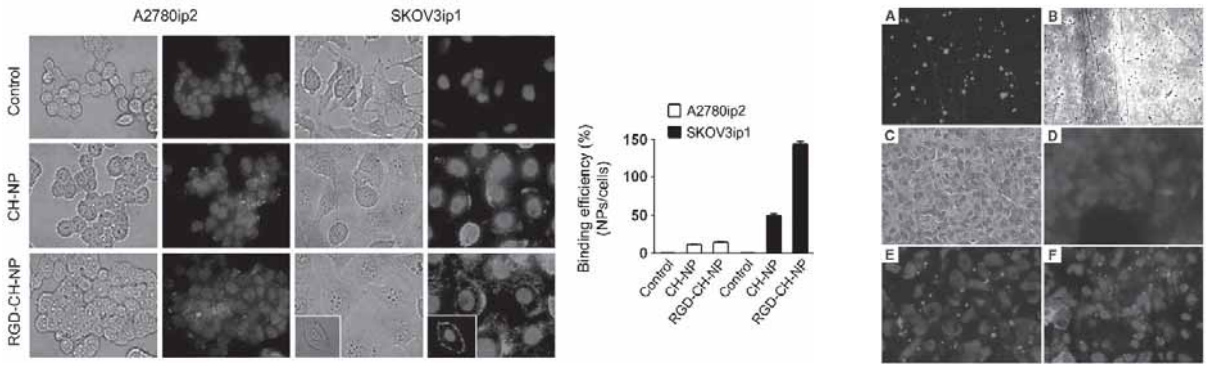
The value of nanomaterials based delivery has become apparent for new types of therapeutics such as using nucleic acids, which are highly unstable in systemic circulation and sensitive to degradation. These include DNA and RNA based genetic therapeutics such as small interfering

RNAs (siRNAs), and microRNAs (miRNAs). Gene silencing therapeutic, siRNA, have been reported to have significantly extended half-lives when delivered either encapsulated or conjugated to the surface of nanoparticles. These are used in many cases to target 'undruggable' cancer proteins. Additionally he increased stablility of therapies delivered by nanocarriers, and often combined with controlled release, has been shown to prolong their effects.

## Pictures

**FIG: 1** Targeted therapy with RGD – chitosan nanoparticles

**FIG: 2** Acuumulation of siRNA with DOPC nanoliposomes in vivo




(A) Fluorecent and phase

(B) View of Liposomes after siRNA incorporation.

(C) Hematoxylin and Eosin stain of HeyA8 ovarian tumor.

(D) Autofluorescence in tumor 48 hours after intravenous administration of nonfluorescent control siRNA.

(E) Tumor accumulation of Alexa 555 siRNA (red fluoresce) incorporated in DOPC.

(F) Alexa 55 siRNA is seen in both tumor cells and surrounding macrophages (green).

## Conclusion

Advances in nanomedicine offer new opportunities to improve the anticancer armamentarium. Nanotechnology is definitely a boon for diagnosis , treatment and prevention of many dieases including cancer. Targeted and nontargeted nanoparticles are currently in preclinical and clinical phases indicating the impact of delivery systems on the field. Predicting the futureof nanotechnology in drug delivery systemis not possibledue to its high developingtechnologyand rapid changes. Further studies in nanomedicine will improve therapeutic window of drugs with immensely reduced side effects leading to improved patient outcomes.

## References

[1] BRAY et al. Global cancer transitions according to the human development Index (2008 – 2030): a population based study. The Lancet Oncology 2012 [PubMed]

[2] JATZKEWITZ, 1954. Incorporation of physiologically-active substances. I. Incorporation of mescaline peptide into polyvinylpyrrolidone. Hoppe-Seyler'sZeitschrift fur physiologischeChemie. 297: 149[PubMed]

[3] BANGHAM HORNE 1964, BANGHAM et al. Negative staining of phospholipids and their structural modification by surface-active agents as observed in electron microscope. Journal of molecular biology. 1964; 8:660-IN10. [PubMed]

[4] SCEFFEL U, WANGER HN, RHODES BA, NATARAJ TK. Albumin mircospheres for study of reticuloendothelialsyste. Journal of Nuclear Medicine. 13:498 [PubMed]

[5] GRADISHAR WJ, TJULANDIN S, DAVIDSON N, SHAWH, DESAI N, BHAR P, HAWKINS M, O'SHAUGHNESSY J. Phase 3 trail of nanoparticle albumin-bound paclitaxel compare with polyethylated castor oil-based paclitaxel in women e-with breast cancer. Journal of clinical oncology, 2005: 23:7794-7803. [PubMed]

[6] CASALUCE F, SGAMBATO A, ROSSI A, MULSHINE JL. The US FDA has approved Abraxane for the treatment of non-small-cell lung cancer Aurora: a new light of targeted therapy in small-cell lung cancer. Lung Cancer. 2012; 1:251-254.

[7] YUAN F, DELLIAN M, FUKUMURA D, LEUNIG M , BERK DA, TORCHILIN VP, JAIN RK. Vascular permeability in a human tumorxenograft: molecular size dependence and cutoff size. Cancer research. 1995; 553752-3756.

[8] TORCHILIN VP. Recent advances with liposomes as pharmaceutical carriers. Nature Review Drug Discovery. 2005: 4:145-160 [PubMed]

[9] YANG SJ, LIN FH,TSAI KC, WEI MF, TSAI HM, WONG JM, SHIEH MJ. Folic acid conjugated chitosan nanoparticles enhanced protoporphrin 11 accumulation in colorectal cancer cells. Bioconjugate chemistry. 2010;21:679-689

[10] FERNANDES JC, WANG H, JREYSSATY C, BENDERDOUR M, LAVIGNE P, QIU X, WINNIK FM, ZHANG, DAI K, SHI Q. Bone- protective effects of nonviral Gene Therapy with Folate-Chitosan DNA Nanoparticle containing interleukin-1 receptor Antagonist gene in Rats with Adjuvant-induced Arthritis. Molecular Therapy. 2008; 16:1243-1251.

[11] HAN HD, MANGALA LS, LEE JW, SHAHZAD MM, KIM HS, SHEN D, NAM EJ, MORA EM, STONE RL, LU C. Targeted gene silencing using RGD-labeled chitason nanoparticle. Clinical Cancer research. 2010; 16:3910-3922. [PMC free article]

[12] WARENIUS H, GALFRE G, BLEEHEN N, MILSTEIN C. Attempted targeting of a monoclonal antibody in a human tumor xenograft system. European Journal of Cancer and Clinical Oncology . 1981; 17:1009-1015.

[13] PATEL J. Liposomal doxorubicin: Doxil. Journal of oncology pharmacy practice. 1996; 2:201-210.

[14] MOGHIMI SM, HUNTER AC, MURRAY JC. Long-circulating and target-specific nanoparticles: theory to practice. Pharmacological reviews. 2001; 53:283-318.

[15] PETROS RA, DESIMONE JM. Strategies in the design of nanoparticle for therapeutic applications. Nature reviews drug discovery. 2010; 615:627.

[16] WONG AD, DEWIT MA, GILLIES ER. Amplified release through the stimulus triggered degaradation of self-immolativeoligomers,dendrimers and linear polymers. Advanced drug delivery reviews.2008; 60:939-954.

[17] ALEXS F, PRIDGEN E, MOLNAR LK, FAROKHZAD OC. Factors affecting the clearance and biodistribution of polymeric nanoparticle. Molecular pharmaceutics. 2008 5:505-515. [PMC free article]

[18] CHOI HS, LIU W, MISRA P, TANAK E, ZIMMER JP, IPE BI, BAWENDI MG, FRAGIONI JV. Renal clearance of quantum dots. Nature biotechnology. 2007;25:1165-1170. [PMC free article]

[19] PETROS RA, DESIMONE JM. Strategies in the design of nanoparticles for therapeutic applications. Nature review drug discovery. 2010 9:615-627. [PubMed]

[20] BAWA R, SIEGEL AR, MARASCA B, KAREL M, LANGER R. An explanation for controlled release of macromolecules from polymers. Journal of controlled release. Cell Cycle. 2004;3:1033-1040. [PubMed]

[21]. PANYAM J, DALI MM, SAHOO SK, MA W, CHAKRAVARTHI SS, AMIDON GL, LEVY RJ, LABHASETWAR V. Polymer degradation and in vitro release of a model protein from poly(d, l-lactide- co-glycolide) nano-and microparticles. Journal of controlled release. 2003;92:173-187 [PubMed]

[22] CHAMPION JA, KATARE YK, MITRAAGOTRI S. Particle shape: a new design parameter for micro-and nanoscale drug delivery carriers. Journal of controlled release. 2007; 121:3-9 [PMC free article]

[23] MOGHIMI SM, HUNTER AC, MURRAY JC. Long-circulating and target-specific nanoparticles: theory to practice. Pharmacological reviews. 2001; 53:283-318.

[24]. DECUZZI P, PASQUALINI R, ARAP W, FERRARI M. Intravascular delivery of particulate systems: does geometry really matter? Pharmaceutical research. 2009; 26:235-243. [PubMed].

# Nanoparticles of Biodegradable Polymers for Cancer Diagnosis

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***Abstract***

*Cancer is an ever-increasing menace that needs to be curbed soon. It's the nanotechnology that will take over the thunder of cancer mortality rate. Cancer is the second leading cause of death globally, a devastating disease, being responsible for 13 % of all deaths worldwide. One of the main challenges in treating cancer concerns the fact that anti-cancer drugs are not highly specific for the cancer cells and the "death" of healthy cells in the course of chemotherapy treatment is inevitable. In this sense, the use of nanoparticles to deliver the anti cancer drug at specific targets can be seen as a powerful tool to minimize or overcome this very important issue. Nanoparticles can be designed to target specific tissues in order to mitigate side effects. Bioabsorbable polymers, due to their inherent characteristics, and because they can be synthesized in a variety of forms, are materials whose importance in the nanotechnology for cancer therapy has risen significantly in the last years. Nanomedicine is to apply and further develop nanotechnology to solve problems in medicine, i.e. to diagnose, treat and prevent diseases at the cellular and molecular level. It demonstrates through a full spectrum of proof-of-concept research, how nanoparticles of biodegradable polymers could provide an ideal solution for the problems encountered in the current regimen of chemotherapy.*

**Key words**

**Nano particles, Biomaterials, Nanobiotechnology, Cancer nanotechnology.**

## Introduction

Cancer arises from the transformation of normal cells into tumour cells in a multistage process that generally progresses from a pre-cancerous lesion to a malignant tumour. In normal condition, cell division is controlled by the apoptosis complex. The apoptosis complex is activated by tumor suppressor protein $P^{53}$ and the tumor necrosis factor. When both mechanisms malfunction, cells undergo uncontrolled cell division and grow to malignant tumor. Capillaries grow abnormally within the tumor. The malignant tumour obtain nutrients from the surrounding healthy tissue. When the tumor is enlarged, some tumor cells enter the blood stream and eventually invade other parts of the body and form other tumors. This phenomenon is known as metastasis and is a fatal condition. In spite of many advances in **cancer** treatment, one of the biggest challenges is to ensure that normal cells do not get damaged while destroying malignant tumours. In the case of most therapies, either oral or intravenous, the drug

gets distributed throughout the body. As a result, higher dosages are required, which makes the treatment expensive To overcome the problems faced in current treatment methods, scientists are trying to take advantage of the increased proliferation activity of cancer cells by adopting targeted therapy through the use of nano materials without causing much harm to a non-cancerous tissue.

## Discovery

Paclitaxel is one of the best anti cancer drug, which has excellent therapeutic effects against a wide spectrum of cancers. The formulation of paclitaxel uses in its currently clinical administration includes Cremophor EL, which has been found to cause serious side effects. Nanoparticles formulation of paclitaxel provides an ideal solution for this problem and achieve a sustained chemotherapy. A novel copolymer ,poly(lactide)-vitamin ETPGS (PLA-TPGS),was synthesized from lactide and d-alpha-tocopheryl poly ethylene glycol 1000 succinate by bulk polymerization for nanoparticle formulation of anti cancer drugs. Paclitaxel –loaded PLA-TPGS nanoparticles were fabricated .The drug release from PLA-TPGS nanoparticle was found to be bi phasic with an initial burst of 17% in the first day, followed by a sustained pattern with 51% release after 31 days. Thus the Biodegradable nanoparticles started gaining increased attention for their ability to serve as a viable carrier for site specific delivery of drug, vaccine, gene and other biomolecules in the body. They offer enhanced bio compatibility, superior drug encapsulation and convenient release profiles for a number of drugs, vaccines and biomolecules to be used in a variety of applications in the field of medicine

## Nanoparticles preparation and drug encapsulation:

Biodegradable nanoparticles can be prepared from a variety of materials such as proteins, polysaccharides and synthetic biodegradable polymers. The selection of the base polymer is based on various designs and end application criteria depending. The polymer is dissolved in an organic solvent such as dichloromethane, chloroform or ethyl acetate. The drug is dissolved or dispersed in the preformed polymer solution followed by emulsification of the mixture to form an oil/water emulsion using an appropriate surfactant/emulsifying agents. The solution is then poured in a controlled manner into an aqueous solution with surfactant. Nanoparticles are formed instantaneously by rapid solvent diffusion. And, the solvent is removed under reduced pressure. Then after, Vaccines or drugs/therapeutic agents are incorporated in the NPs either by dissolving the drug in the polymerization medium or by adsorption/attachment of the drug onto the polymerized and fully formed NPs. The NP suspension is then purified by removing stabilizers. The concentration of surfactant and the stabilizer determines the final size of the NPs formed.

## It’s not just nanoparticles but it’s the NANOPARTICLE OF BIODEGRADABLE POLMER

Keeping in the view of the minor after effects of chemical nanoparticles which may be when after injection into the body. And so it’s the BIODEGRADABLE Nanoparticles that which doesn’t even take up a chance of showing any after effects because of its biomolecular nature that, when given to the body either *intravenous* (*IV*) *injection*, infusion or administered orally instead of releasing its chemical content as such of normal chemical nanoparticles, the biodegradable nanoparticles degrades biological and releases the biological molecules (the contents of the biodegradable np’s) i.e., they undergoes hydrolysis in the body to produce biodegradable metabolite monomers such as lactic acid and glycolic acid. The biological molecules released are mostly the end products of biological

process that takes in the human body viz., which instead builds up the body's physiology. There is very minimal systemic toxicity associated with the use of biodegradable nanoparticles for the drug delivery or biomaterial applications.

A few of the most extensively used biodegradable polymer matrices for preparation of nano-particles are: Poly-D-L- lactide-co-glycolide (PLGA), Polylactic acidPLA, Poly-å-caprolactone (PCL), Chitosan, and Gelatin.

These biodegradable NPs are very efficient in delivery and controlled release of the drugs. They are nontoxic, bioactive and inexpensive. Gelatin is a poly-ampholyte consisting of both cationic and anionic groups along with a hydrophilic group.

## Why should there be a replacement of Nanoparticles by the Biodegradable Nanoparticles:

Nanoparticles, however, had a different set of problems of their own. They had a very short circulating life span within the body after intravenous administration. The nanoparticles administered intravenously were rapidly cleared from the body by phagocytic cells. One of the problems faced in the use of nanoparticles via the intravenous route was their speedy removal by the phagocytic cells (macrophages) in the body. MPS filters and eliminates any injected particulate matter including NPs from the blood stream if they are recognized as foreign body. The therapeutic effect of drugs delivered via nanoparticles was thus minimized and could not be sustained. In recent years the problem of phagocytic removal of nanoparticles. Unless the injected nanoparticles are modified in a way to escape recognition as foreign particles, they will be phagocytosed and removed from the circulation. Surface modification of the NPs[1] therefore plays a critical role in their successful applications in-vivo. Once NPs are surface modified with biomolecules found normally in the body, they will be able to circulate within the blood vascular system for longer period of time. This increases the probability of nanoparticles reaching their target rapidly and safely when compared to non-modified NPs. Yes, it's the biodegradable nanoparticle that blows out the problem of detection and removal by the phagocytes[2] before its action.

NPs can be used to safely and reliably used as a wide variety of biomolecules, vaccines and drugs can be delivered into the body using nanoparticulate carriers and a number of routes of delivery. In addition, nanoparticles tagged with imaging agents[3] offer additional opportunities to exploit optical imaging or MRI in cancer diagnosis.

Other Specific Applications of Biodegradable NPs:

- Tumor Targeting
- Nanoparticles for Oral delivery
- Nanoparticles for vaccine/gene delivery
- Nanoparticles for drug delivery into the brain

## Conclusion

Cancer disease is still an extremely complex disease. In the last decade, there are many new approved drugs and hundreds of agents are still under clinical trials aiming to get rid of this malignant disease. The nanoparticle drug delivery systems is more advantageous than the other clinical approaches for cancer therapy since the ability to specifically target nanoparticles along with the controlled delivery of a therapeutic payload provides powerful new ways to treat cancer

disease. NPs are a potentially viable vaccine and drug delivery system capable of delivering a multitude of therapeutic agents and biomolecules at the targeted sites in the body. To optimize NPs as a delivery system, greater understanding of the different mechanisms of biological interactions. Biodegradable NPs appear to be a promising drug delivery carrier system because of their versatile formulation, sustained release properties, sub cellular size and biocompatibility with various cells and tissue in the body. The main goal is to build the necessary competence for developing safe and efficient nanoparticles for diagnosis and personalized therapy of cancer. Although some nanoparticles have not been successful when being clinically translated, several new and promising nanoparticles are currently in development and show great promise, thereby providing hope for new treatment options in the near future. However, all newly developed nanoparticles, whether they are used as carriers for drugs, therapeutic agents, or imaging agents, will need to be thoroughly characterized physiochemically, pharmacologically, and immunologically before they can be approved for use in humans.

## References

[1] Xu T, Zhang N, Nichols HL, Shi D, Wen X. Modification of nanostructured materials for biomedical applications. Materials Science and Engineering: C. 2007;27(3):579–594.

[2] Mohanraj VJ, Chem Y. Nanoparticles-A Review. Tropical Journal of Pharmaceutical Research. 2006;5(1): 561–573.

[3] Liu Y, Miyoshi H, Nakamura M. Nanomedicine for drug delivery and imaging: A promising avenue for cancer therapy and diagnosis using targeted functional nanoparticles. International Journal of Cancer. 2007;120(12): 2527–2537. [PubMed]

## Inauguration of Research Training and Consultancy Cell

# GUIDE LINES FOR THE PREPARATION OF MANUSCRIPTS

All submitted Research manuscripts must follow pattern given below:

- Title
- Author Name, Affiliation and Email ID
- Abstract (Maximum 100 words)
- Keywords (Maximum Five)
- Introduction
- Problem Definition
- Methodology / Approach
- Results & Discussion
- Conclusion
- References
- Each Author (s)Photo(s)

- **Title:** Title must be informative and specific. It should be easily understandable by reader and should reflect motive of the research paper.
- **Author Name, Affiliation and Email ID:** Author First name and Last name only. Provide email id.
- **Abstract:** One paragraph containing at most 100 words. It is a summary of the report describing the question investigated, the methods used, the principle results and conclusions.
- **Keywords:** Five most important terms that describe your research domain and specific problem area investigated.
- **Introduction:** It is a brief section usually not more than a page. This section includes a short history or relevant background of the research area being addressed.
- **Methods / Approach:** This section should describe how you are supposed to rectify the problem, what approach or what methodology you are supposed to use in your paper.
- **Results / Discussion:** This section describes the outputs generated in the methodology section. Elaborate and compare your results with previous research performed in the past.
- **Tables/Graphs:** Insert within the text at the appropriate places rather that at the end of your document. All notes to tables should be given at the bottom of the respective table Pictures/Videos/Audios – insert within the text at the appropriate places rather than at the end of your document.
- **Conclusion:** Final extract of your research performed. Concisely elaborate your final output here.
- **References:** It includes all the papers, website, books etc. which is referred by author(s) in the present work.
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  - Figure / Table Caption Font Size: 10pt
  - Reference Bullet Format: [1], [2] ...

# Editorial Board