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A Carbon Footprint of Medical Faculties in B J Medical College, Ahmedabad City, Gujarat, India

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ABSTRACT

Introduction: A Carbon footprint measures human consumption of natural resources in comparison to Earth's ecological capacity to regenerate them. It represents the human impact on the Earth in a clear manner.

Material & methods: This cross-sectional study was carried out among faculty members of B.J Medical College & Hospital Ahmedabad, Gujarat, India. The study was conducted in month of June to October 2011. Study Participants included 125 medical doctors of different departments of the college and hospital interviewed by pre-designed and a pre-tested questionnaire. Coded data were analyzed in Epi info version 3.5.1. Percentages have been presented.

Results: Male: female ratio 56:44.Their carbon foot-print was poor because 88% of them didn't use share-based vehicles or public transport. Only 5.6% had solar devices at home. Housing-footprint was good as 100% of them used water-saving-techniques at home. Use of elevator (40.6%) was found common. 62.4% never used organic food. Goods & service foot-print was poor; only 13.6% didn't use plastic bags on daily basis. 23.2% never bothered about usage of mobile phones, 12.8% were not interested in tree-plantation.

Key words: Carbon-foot-print, Eco foot-print, doctors and environment

INTRODUCTION

A Carbon foot print also called as Ecological footprint measures human consumption of natural resources in comparison to Earth's ecological capacity to regenerate them. Using this assessment, it is possible to estimate how much of the Earth (or how many planet Earths) it would take to support humanity if everybody followed a given lifestyle. For 2007, humanity's total ecological footprint was estimated at 1.5 planet Earths; that is, humanity use resources 1.5 times as quickly as Earth can renew them. Every year, this number is recalculated through statistics and relevant research [1]

Calculating ecological footprints require complex calculations Individually, each of us has a "footprint" which can be used as an indicator because then only we can measure the impact of our lifestyle on our environment. It is also important to set a goal to change our lifestyle to sustain the resources available with us and for our future generations. Calculation of the footprint takes into account everything we do; the food we eat, the house we live in, the car we drive, paper we use, how many plants we grow and likewise.

Living in a healthy environment is one of the major determinants of preventive as well as curative medicine. But before advising anybody the benefits of healthy environment it is very important for a medical doctor to watch his or her environmental impacts.

MATERIALS AND METHODS

This cross-sectional study was carried out among faculty members of B.J Medical College & Hospital Ahmedabad, Gujarat, India. The study was conducted in month of June to October 2011.A total of 125 doctors were interviewed which included 17 professors, 16 associate professors, 56 assistant professors and 36 tutors. A validated self-administered pre tested structured questionnaire was used to collect the data regarding different component of Carbon and ecological foot print which include energy consumption (solar and electrical) pattern , fuel consumption ,waste disposal preference of individuals etc. Final ecological foot print of any individual is composite index of percentage of share to different environmental variables like carbon ,Hosing ,Food ,Good & service foot print and miscellaneous activities in daily routine that leads directly or indirectly environmental pollution. These data were coded and entered in epi info version 3.5.1. The data entry interface was designed to check for missing values and acceptability constraints. The percentages have been presented.

RESULTS

A total of 125 Doctors were included in our study with male female ratio 56:44. Majority of the faculty hold the masters degree (69.6%) (**Table 1**). Among the surveyed group majority (88%) uses their personal vehicle to reach at service site. Very few uses car pooling (7.2%) or public transport (4%). To our surprise 28.8% prefer plane/cruise for vacation touring. But still 54.8% prefer to use train. At home faculty prefers tube light (66.4%) but only 27.2% uses CFL lights at their homes. Only 5.6% are using solar energy devices .to this contrast 76% of doctors have never heard of same. (**Table 2**).

Table 1: Profile of Doctors (study subjects)

Characteristics	Frequency (%)
Sex	
Male	70 (56)
Female	55 (44)
Designation	
Tutor	36 (28.8)
Assistant Professor	56 (44.8)
Associate Professor	16 (12.8)
HOD & Professor	17 (13.6)
Degree	
M Sc	1 (0.8)
MBBS	18 (14.4)
MD	87 (69.6)
MS	19 (15.2)
Department	
Clinical	58 (46.4)
Non clinical	67 (53.6)

Table 2: Carbon Footprint

Variables	Frequency(%)
Vehicle used to reach the service campus	
Car/two wheeler	110 (88)
Car pool/share based vehicle	9 (7.2)
Public transport	5 (4)
Cycle	0 (0)
Walking	1 (0.8)
Vehicle used during vacation touring	
Plane/cruise	36 (28.8)
Car/two wheeler	11 (8.8)
Bus	5 (4)
Train	73 (58.4)
Type of light sources used at home	
Electric bulb	1 (0.8)
Tube light	83 (66.4)
LED light	7 (5.6)
CFL light	34 (27.2)
Use of solar energy device	
Never heard	95 (76)
Heard but don't use	23 (18.4)
Yes, using it	7 (5.6)
Switch off electrical appliances when not in use	
No	4 (3.2)
Yes	88 (70.4)
Yes and also remove the plug	10 (8)
Yes & also advice others to do the same	23 (18.4)
Source used to boil water during winter	
By burning wood	1 (0.8)
Gas	41 (32.8)
Electric heater/geyser	67 (53.6)
Solar heater	8 (6.4)
Don't use boil water	8 (6.4)
Preference for cooling during summer at night	
Air conditioner	62 (49.6)
Air cooler	6 (4.8)
Fan	34 (27.2)
Terrace/courtyard(without fan/Air cooler)	23 (18.4)
Protection from mosquito bite	
Aerosol spray	11 (8.8)
Coil	12 (9.6)
Liquidator	83 (66.4)
Bed net	19 (15.2)
Turn off vehicle engine at traffic signal	
No	40 (32)
Yes	85 (68)
Regular PUC (Pollution under check) certificate	
No	15 (12)
Occasionally	38 (30.4)
Yes regularly	72 (57.6)
Daily print out for personal use	
21-50 papers	1 (0.8)
6-20 papers	2 (1.6)
1-5 papers	51 (40.8)
Nil	71 (56.8)
Waste paper disposal	
Burn them	1 (0.8)
Through them away	12 (9.6)
Give it to local waste paper collector	106 (84.8)
Reuse it	6 (4.8)
When not using computer/laptop	
Keep it on	2 (1.6)
Turn off monitor/screen	21 (16.8)
Hibernate mode	12 (9.6)
Switch off	90 (72)

Table 3: Housing Foot Print

Variables	Frequency (%)
Type of House	
One room /hostel	21 (16.8)
Flat 2BHK(Bedroom Hall Kitchen)	17 (13.6)
Flat 3 BHK or more	63 (50.4)
Bungalow/row house	24 (19.2)
Type of furniture	
Wooden	95 (76)
Plastic	6 (4.8)
Glass /Iron	3 (2.4)
Old /Antique	21 (16.8)
Duration preferred to change the furniture	
Within 5 years	2 (1.6)
5 to 10 years	23 (18.4)
>10 yrs	20 (16)
When Damaged	80 (64)
Water saving habits*	
Taking bath	
With bucket	125 (100)
With shower	91 (72.8)
Car wash (N=89)	
With bucket	63 (70.7)
With running pipe water	26 (29.3)
Close tape when not in use	
Yes	111 (88.8)
No	14 (11.2)
Washing machine run when fully loaded (N=92)	
Yes	78 (84.7)
No	14 (15.2)
Fix leaks immediately	
Yes	4 (3.2)
No	121 (96.8)
Use of Elevator	
Yes	51 (40.8)
Beyond 4th floor	42 (33.6)
Don't use	32 (25.6)

*multiple answer are accepted & facilities not available with them are opted out from those questions

Table 4: Food foot-print

Variables	Frequency (%)
Type of diet	
Vegetarian	82 (65.6)
Mix vegetarians	43 (34.4)
Use of organic food	
Mostly	14 (11.2)
Sometimes	33 (26.4)
Never	78 (62.4)
Kitchen garden	
Present	9 (7.2)
Absent	116 (92.8)

Total 78.4% faculty believes in switching off electrical appliances when not in use. Solar heaters (6.4%) are not so popular for boiling the water during winters. Nearly 18.4% doctors prefer to use terrace or courtyard at night in summer. Liquidator (66.4%) is common mosquito repellant by them. In contrast to this only 15.2% uses bed net at night. 32% of doctors don't turn off their vehicle engine at traffic signal but 57.6% regularly go for PUC. On the good part 56.8% don't print any paper daily. Nearly 85% of doctors dispose their waste paper by giving it to local waste paper collector. 72% of them switch off their computer and laptops when not in use (**Table 2**)..

Half (50.4%) of the faculty members lives in flat of 3 BHK or more. Only 19.2% are having individual bungalows / row house. The preference for wooden furniture was there in 76% of cases but there are people who love old and antique furniture (16.8%). Majority of them (64%) prefer to change furniture when damaged. About water saving habits all of them uses bucket to take bath and 70.7% even prefer buckets to wash their car. At the good part 88.8% closes tap when not in use and nearly same (84.7%) run washing machine when fully loaded. To all above information total contrast was seen with only 3.2% of doctors fix the leaks immediately. Nearly one fourth of the doctors don't use elevators. (**Table 3**).

62.5% prefer to eat vegetarian diets. 11.2% of doctors go for organic food whenever possible while 62.4% had never ate organic food. Kitchen garden is not very popular among the doctors. (**Table 4**).

63.2% of doctors never see tags before purchasing any good. Surprisingly 86.4% of doctors still use plastic bags and among the users half of them give used plastic bags to local waste paper collector. (**Table 5**).

56% of faculty watch less than 1 hour television per day. Among doctors 56.8% don't play Holi but 6.4% play Holi with artificial colour,In Diwali 23.2% of the doctors enjoy burning crackers with lots of noise & smoke but 40.8% of doctors celebrate it, by lighting diyas & eating sweets. (**Table 6**).

DISCUSSION

In 1970 the first Earth Day served as an activator for behavior analysts to embark on a new challenge. We were reminded that human behavior causes serious damage to the earth's environment and threatens the future of humans and other species . Among the surveyed doctors, majority were holding class one post with master degrees. As we interviewed regarding their individual carbon foot print, only 11% doctors uses car pooling, shared vehicle or public transport to reach service campus. Changing transportation behaviors is a crucial area for intervention, not only for conservation of resources, but also because the use of motor vehicles is a major cause of greenhouse gases. Behaviors targeted for change include reducing the miles traveled in personal vehicles[2], increasing miles per

Table 5: Goods & services foot print

Characteristics	Frequency (%)
Do you see tags before purchasing goods*	
Almost never	79 (63.2)
Sometimes	34 (27.2)
Always	12 (9.6)
Do you use plastic bags	
Yes	108 (86.4)
No	17 (13.6)
Disposal of unused plastics bags	
Burn them out	2 (1.6)
Through them away	30 (24)
Local waste paper collector	58 (46.4)
Reuse it	35 (28)

* like recyclable, natural ,organic, or made by alternate fibers

Table 6: Miscellaneous items

Variables	Frequency (%)
Hours of watching TV/day	
More than 5 hrs	2 (1.6)
3-5 hrs	8 (6.4)
1-3 hrs	45 (36)
< 1 hrs	70 (56)
Celebration of Holi	
Oil paints	0 (0)
Artificially	8 (6.4)
Natural colour	33 (26.4)
Plain water	13 (10.4)
Don't play holy	71 (56.8)
Diwali celebration	
Cracker make noise	29 (23.2)
Cracker don't make noise	45 (36)
Celebrate without fire crackers	51 (40.8)
Limitation of mobile usage	
Never bothers	29 (23.2)
Cutting down unnecessary long calls	44 (35.2)
SMS whenever possible	15 (12)
Switch off when not in use	8 (6.4)
Land line	29 (23.2)
Tree planted so far	
Nil	16 (12.8)
1-5	53 (42.4)
6-10	18 (14.4)
11-15	10 (8)
More then 15	28 (22.4)

gallon through changes in the driving behaviors of professional drivers [3], and increasing the use of carpools [4], public transportation [5], and bicycles [6]. There are 76% doctors who had never heard or bought solar energy devices.

Nearly 70% of them switch off electrical appliances when not in use. Despite their great potential, compact fluorescent lights (CFLs) have not yet been adopted on a wide scale because CFLs cost ten times more than incandescent bulbs, while the monetary savings over the five-year life of the bulb ($30- $50) and the environmental benefits are remote and relatively invisible Decreasing home energy use is also important, as 36% of all electricity is used in residences, and most electricity consumed in the United States is generated by burning fossil fuels .In our survey we found electric heater (53.6%) was common source of boiling water during winter while air condition was common source of cooling in summer. Decreasing the energy used in buildings for the purposes of heating, cooling and lighting has also drawn considerable attention. This is an important area for intervention, since burning fossil fuels accounts for nearly 70% of all electricity generation

Air condition contributes to dirty air, acid rain and global warming. Based on government data, Stan Cox, a scientist at the Land institute, Kansas, calculated that more than 1500 kg of carbon dioxide is emitted each year due to air conditioning the average US homes [7] .

Use of liquidator is popular among the doctors as mosquitoes repellant. Researchers proved that pyrithroids used in repellants leads to hyper excitation of nervous system & prolong uses results in corneal damage & asthma. About 12% of users are seriously affected by use of repellants.

About 68% of faculty told us that they turn off engine at traffic signals.

Most of the doctors don't use printer on daily basis (56.8%) and majority of them give waste paper to local waste paper collector (84.8%). [16] Austin et al (1993) increased the rate of paper recycling by 54% over baseline by placing signs describing items appropriate for recycling and disposal over recycling bins and garbage can [9].DeLeon and Fuqua (1995) demonstrated that combining a public commitment to recycle paper with feedback resulted in a 40% increase in the weight of recycled paper for residents of an apartment complex.[10]

Doctors have 3 BHK flats (50.4%) or bungalow (19.2%) as a residential place. Among them 76% prefer wooden furniture. They all have good water saving habits like taking bath with bucket (100%), car washing with bucket (70.7%) and run washing machine when fully loaded (84.7%) . But fixing leaks immediately is not seems to their priority (3.2%).In an intervention, Thompson and Stoutmeyer (1991) found that a message focusing on the long-term environmental consequences of water conservation was more effective in decreasing household water consumption than a message that focused solely on the personal economic benefits that could be gained from conservation [11].We have 32 (25.6%) doctors who don't use elevators and prefer stair most of the time. It is said that if everyone who could take the stairs did take the stair, we can see some significant energy saving. Since stair climbing requires that we spend nine times as much energy as we do standing still, a collective

boycott would probably lead us to higher food consumption. In our survey it was seen that 65.6% doctors were vegetarian. According to a 2006 survey, it notes that only 40% of India (1.2 billion people) identifies themselves as vegetarian [12].

Use of organic food is not that common in our doctors' community, only 11.2% always prefer organic food and 26.4% uses it sometimes. Organic food, farming, & lifestyles are global trends that are finding their way into India. It means going back to traditional means of producing food that Indian farmers utilized for centuries till artificial pesticides and fertilizers came in under the Green Revolution banner. This revival of organic food production and retail has been fraught with multiple debates around the cost of such produce, lower yields and the resulting inability to feed India's growing population, coupled with a lack of awareness around the benefits of organic produce by end consumers [13].

Very few (7.2%) doctors have kitchen garden at their home. In congestion of urban city life, vegetable gardens for apartment dwellers seem like an impossible prospect. However, the concept of Kitchen gardens is picking up in India, as more people staying in apartments want their own home grown vegetables [14]. Nearly 90% of faculty never bothered to see tags before purchasing goods. To our surprise 86.4% of doctors use plastic bags in day to day routine. Among them majority (46.4%) either give unused bags to local waste paper collector or just throw them away (24%). Single-use bags, both paper and plastic, represent a huge threat to the environment. This threat is not only related to the sheer volume of their ending up in landfill, but also to the resources needed to produce, transport and (occasionally) recycle them, and the emission resulting from these processes. Single - use plastic bags are also well known for their interference in eco system and the part they play in flood events, where they clog pipes and drains [15].

To our surprise 23.2% never bother regarding the use of mobile phones for long time, but 35.2% said that they prefer cutting long calls.

There are 12.8% of faculty who never participate in tree plantation, 22.2% of the faculty has planted more than 15 trees at their job sites.

CONCLUSION

Given that environmental degradation threatens the well-being of all inhabitants of our planet, environmental preservation may be one of the most important health & social issues that must required great focus attention with responsibility to create awareness & build environment friendly practices that implemented in regular use.

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