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Plantation is an effective measure in addressing the health issues

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Abstract

Objective: To highlight the influence of environmental hazards and geographical degradation on population health status.

Methods: The ecological study was conducted at the Institute of Health Management, Dow University of Health Sciences, Karachi, and incorporated facts and figures gathered from primary and secondary data sources between November and December 2016. Employing proportionate quota sampling, data from both developed and developing countries was included. Parameters analysed included life expectancy, health expenditure characterising health profile, urbanisation, forest, agriculture land area proportions characterising geographic profile, and air, noise pollution index characterizing environmental profile. Data was analysed on Microsoft Excel 2016.

Results: Of the 20 countries, 4(20%) were developed and 16(80%) were developing. Overall, 5(25%) countries, either considerably or modestly-forested were likely to be less polluted, while the opposite was true for 7(35%) others. Besides, 7(44%) agrarian states -- 2(50%) developed and 5(31%) developing -- correlated sustenance proportionately with healthy prolonged life expectancy. Overall, 15(75%) countries validated healthy life expectancy proportionate with health expenditure. The only exceptions were 5(31%) developing countries. Also, 14(70%) states associated urbanisation with health expense.

Conclusion: Growing urbanisation is the biggest threat to ecological resources. Plantation is an effective measure to address these challenges.

Keywords: Plantation, Environmental hazards, Geographical degradation, Healthy life expectancy, Health expenditure. (JPMA 68: 1566; 2018)

Introduction

Earth, characterised by existence of life, covered by three-fourth of water and one-fourth of land, is house to numerous species, running mechanism and floating phenomenon.

Plants, among the most ancient species on earth and found in both terrestrial and aquatic terrain, are source of food, shelter, clothing, fuel, medicines, and keeps the ambience oxygenated, apart from fulfilling all the needs and wants.[1]

With rapid globalisation, technological innovations, economic progression, nuclear advancements and chemical exploitations, the world is a better place to live in, but the health status of the people has drastically suffered. Growing urbanisation has threatened the ecological resources, ensuing environmental hazards, fauna and flora attenuation and populace health diminution.[2]

The current study was planned to highlight the influence of environmental hazards and geographical degradation on the general population's health status.

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Material and Methods

The ecological study was conducted at the Institute of Health Management, Dow University of Health Sciences, Karachi, and incorporated facts and figures gathered from primary and secondary data sources between November and December 2016.

Employing proportionate quota sampling, data from both developed and developing countries was included. All figurative data was derived from five major websites related to the World Health Organisation (WHO),[3] the World Bank,[4] World Health Rankings,[5] United Nations (UN)[6] and the International Statistics at Nation Master,[7] offering open access.

The developing countries selected were Brunei, Central Africa, China, Ghana, Kenya, Madagascar, Oman, Qatar, Russia, Sierra Leone, Singapore, South Africa, Suriname, Tuvalu, Timor-Leste and Uruguay. The developed countries were Australia, Canada, Japan and Switzerland.[6] Priority was given to countries exhibiting extreme trend in at least one of the considered variables, ease of accessibility and availability of data.

Parameters analysed included life expectancy, health expenditure characterising health profile, urbanisation, forest, agriculture land area proportions characterising geographic profile, and air, noise pollution index characterizing environmental profile. For each variable mean was determined, and values were analysed according to the acceptable figures set by the relevant organisations in case of each variable. The values were coded high (above acceptable figures), moderate (around acceptable figures) and low (below acceptable figures) respectively.

Plantation levels were assessed on the assumption that individual oxygen requisition is equivalent of 7 trees[8] and one large plant per 129sq.ft (1.198e-5 sq.km)[9] or 83,441 plant per sq.km. Contrasting variables and inferences drawn were based on correlation analysis. Data was analysed on Microsoft Excel 2016.

Result

Of the 20 countries, 4(20%) were developed and 16(80%) were developing. Profile of each country in terms of health, geography and environment was done (Table-1), Five (25%) countries, either considerably or modestly-forested, were likely to be less polluted, while the opposite was true of 7(35%) others. Besides, 7(44%) agrarian states -- 2(50%) developed and 5(31%) developing -- correlated sustenance proportionately with healthy prolonged life expectancy. Overall, 15(75%) countries validated healthy life expectancy proportionate with health expenditure. The only exceptions were 5(31%) developing countries. Also, 14(70%) states associated urbanisation with health expense.

Tree plantation requirements for healthy, hygienic ambience were estimated for entire population and territories respectively (Table-2).

Discussion

Estimated mean urbanisation in high, middle and low-income countries is around 5, 2 and 0.2%, respectively.[4] European states mostly range between 2%and 8%.[10] Singapore stands among the most, while Tuvalu is the least urbanised state.[4] Growing urbanisation is a threat to environmental resources globally. Around 60% of the world population is likely to switch from rural to urban by 2030.[2] This may lead to environmental hazards, fauna and flora attenuation, and human health diminution.

Globally 14% of the developed countries and 28% of the developing countries have infertile and sparsely vegetated land.[11] Besides, 2.7 million mortalities are a result of insufficient vegetable and food intake.[12] Air pollution is currently the most significant environmental risk to human health. According to WHO, around 7 million global deaths are a result of adulterated air inhalation targeting one in every eight persons. Globally, outdoor and indoor air pollution cause 2.6 million and 3.3 million mortalities, victimising 12% of the affluent, and 88% of humble and indigent nations, respectively. Western Pacific and South-East Asia are the most concentrated regions among all.[13]

Globally, acute lower respiratory infections in children in outdoor and indoor settings (3% and 12%), chronic obstructive pulmonary disease (COPD) (11% and 22%) ischaemic heart disease (40% and 26%), stroke (40% and 34%) and lung cancer(6% and 6%) results mostly out of ambient air pollution enduring high particulate matter (PM) concentration.[13]

PM 2.5, a miniscule but indispensable constituent of air pollution, which is likely to reduce lifespan, is often observed between 13 and 18ug/m^3 mean annual exposure among the developed countries, which is less intense than in the developing countries. According to air quality standard set by the WHO, PM 2.5 10ug/m^3 long-term exposure most preferable,11-14.9 ug/m^3 falls within acceptable range, while beyond 15 ug/m^3 is considered significantly detrimental to human health.[14] Qatar and Oman the infertile countries sparsely agrarian or barren, stand at the extreme of the pollution index.[4] Countries enduring significant pollution index, like Central Africa, Ghana, Kenya, Madagascar, Sierra Leone and South Africa, showed least life expectancies.[4,5]

Every year human activities and natural processes account for 9 billion tons of carbon dioxide emissions, ending up 4 billion tons in the atmosphere, 2 billion tons in aquatic and 3 billion tons in terrestrial area.[5]

Carbon monoxide, lead, ozone, nitrogen dioxide, sulphur

Table-1: Emblematic data analysis.

Selected Countries	Health Profile			Geographical Profile						Environmental Profile	
	Healthy Life Expectancy	Health Expenditure		Urban Area		Forest Area		Agriculture Area		Air Pollution PM 2.5 mean annual exposure ug/m^3	NOISE & LIGHT POLLUTION
		(GDP %)	per capita	(%)	ha per capita	(%)	ha per capita	(%)	ha per capita		
Developed States											
Austrailia	71.9	9.4	6,031	0	0.16	16	5.43	53	2	6	25.74
Canada	72	10.4	5292	1	0.36	38	9.81	7	1.29	7	40.11
Japan	74.9	10.2	3,703	30	0.09	69	0.20	12	0.03	13	45
Switzerland	73.1	11.7	9,674	20	0.10	32	0.15	39	0.05	13	42.86
Mean	73	10	6,175	13	0.17	39	4	28	1	10	38
Developing States											
Brunei	70.3	2.6	958	19	0.23	72	0.87	3	0.01	5	6.25
Cent. Africa	45.9	4.2	16	0	0.00	36	4.03	8	0.37	46	0
China	68.5	5.5	420	4	0.03	22	0.15	55	0.08	58	60.76
Ghana	55.3	3.6	58	3	0.02	41	0.35	69	0.18	23	93.75
Kenya	55.6	3.5	78	1	0.01	8	0.09	49	0.12	16	52.08
Madagascar	56.9	3	14	0	0.01	21	0.51	71	0.15	20	45.83
Oman	66.6	3.2	675	2	0.17	0	0.00	5	0.01	53	45
Qatar	67.8	2.2	2,106	13	0.07	0	0.00	6	0.01	107	65.38
Russia	63.4	7.1	893	1	0.13	50	5.72	13	0.86	17	62.11
Sierra Leone	39.4	11.1	86	1	0.01	42	0.51	55	0.25	19	100
Singapore	73.9	4.9	2752	80	0.01	23	0.00	1	0.00	19	58
South Africa	54.4	4.2	570	4	0.10	8	0.17	80	0.23	30	51.44
Suriname	63.1	5.7	589	0	0.12	98	26.17	1	0.12	18	12.5
Timor-Leste	61.1	1.5	57	2	0.03	46	0.54	26	0.13	19	37.5
Tuvalu	58	16.5	633	0	0.00	33	0.09	60	0.18	7	0
Uruguay	67.9	8.6	1442	3	0.14	11	0.55	82	0.70	11	27.27
Mean	61	5	709	8	0.07	32	2.48	36	0.21	29	45
World	71.4	9.9	1060	3	0.05	31	0.55	38	0.20	44	-
Accepted Values	60-70	5	44	2- 5	0.03-0.15	25-50	0.6-0.8	20-40	0.10	11-15	-

Nferences

Signifies Relationship	Correlation Coefficient		Color Code	
Healthy Life Expectencies Proportionate Agriculture (PER CAPITA)	0.2	Positively	Scale 1	Scale 2
Healthy Life Expectencies Proportionate Forestation (PER CAPITA)	0.1	Positively		
Healthy Life Expectencies Proportionate Health Expenditure (PER CAPITA)	0.6	Positively	C2-C7	C8-C9
Urbaniztion (Per Capita) Proportionate Health Expenditure (PER CAPITA)	0.4	Positively	High	High
Healthy Life Expectencies Reciprocate Air Pollution	-0.1	Negatively	Moderate	Moderate
Forestation Reciprocate Air Pollution	-0.4	Negatively	Low	Low
Agriculture Reciprocate Air Pollution	-0.2	Negatively		

Source: World Health Organization, 2016.* The World Bank,2015.* World health rankings,2015*, United Nations,2016.*International Statistics at Nation Master,2013.*

Table-2: Estimation for plantation requisition.

Selected Countries	Population (X1)	Landarea sq.km (X2)	Trees Requisition By Population (100,000)	Plants Requisition By Land Area (100,000)
		Developed States		
Austrailia	22992654	7682300	1609	6410188
Canada	35362905	9093510	2475	7587716
Japan	126702133	364560	8869	304193
Switzerland	8179294	39516	573	32973
		Developing States		
Brunei	436620	5270	31	4397
Cent. Africa	5507257	622980	386	519821
China	1373541278	9388211	96148	7833617
Ghana	26908262	227540	1884	189862
Kenya	47615739	569140	3333	474896
Madagascar	24430325	581800	1710	485460
Oman	3424386	309500	240	258250
Qatar	2258283	11610	158	9688
Russia	142355415	16376870	9965	13665024
Sierra Leone	6018888	72180	421	60228
Singapore	5781728	709	405	592
South Africa	54841299	1213090	3839	1012214
Suriname	585824	156000	41	130168
Timor-Leste	1261072	14870	88	12408
Tuvalu	10959	30	1	25
Uruguay	3351016	175020	235	146038
		Inference		Y
Trees Requisition By Population				7X1
Plants Requisition By Land Area				83441X2

dioxide and particulates released daily through domestic, locomotive and industrial activities considerably contaminate the air quality and jeopardize individual's health.[16]

Residential, transportation and industrial activities contribute a lot to the clattering, undesirable distractions repugnant to human ears. Beyond its effects on the auditory system, its abuses range from serious damage to brain, heart, kidneys and liver to malfunctioning in ophthalmic, digestive, respiratory, cardiovascular, and neurological systems.[17] Congested infrastructure populated with constructions, billboards, cables, etc., deprive individuals of the peace stemming out of the sight of nature.[18]

Intense noise and light on the pollution perception index was seen in the developing countries more than the developed world.[7] It was at the extreme in Ghana, Sierra Leone and the least in Australia, Brunei.[7]

Plantation characterise vivacity and is an effective health booster. According to estimates, humans inhale 9.5 tonnes of air per year i.e., 740 kg of oxygen per year with one-third of it in each breath worth around 7 to 8 trees.[8]

Forests, covering 30% of earth[4] are the largest reservoirs for the 45% of carbon dioxide emission and 50% of plants' yield.[15] About25-50% coverage of forestation is considered desirable proportions for any country with agricultural and industrial needs.[19] Green lands featuring trees assure daily eradication of carbon (100 lb), particulates (48 lb), nitrogen dioxide (9 lb), sulphur dioxide (6 lb) and carbon monoxide (0.5 lb).[20]

Brunei, Canada, Japan, Switzerland are densely forested and enjoy pollution-free ambience, and have prolonged life expectancies.[4,5]

The proportion of arable and cultivated land 0.1ha per person ensures individual sustainability.[11] Deployment of cultivation land was estimated at 0.2-0.7ha per capita in the developed countries, and approximately 0.2ha per capita in the less-developed countries.[11] Variations in agriculture land proportions and actual utilisation was observed among some developed states, like Australia (52.9%) and Canada (7.2%), and developing states, like China (54.8%), Russia (13.2%), Suriname(0.5%),Timor-Leste (25.6%), Uruguay (82.1%), securing sustenance of 2.00, 1.29, and 0.08, 0.86, 0.12, 0.13, 0.70ha per capita respectively.[4]

Greenery exposure nourishes mental health, charges physical activities and elongates healthy life expectancies. One large plant per 129 sq.ft results in better health outcomes.[9] Dense vegetation in the neighbourhood triggers increased cohesion among masses, enable social bonds and healthy lifestyle. Lack of greenery in the vicinity is a considerable cause of poor health resulting out of lifestyle choice.[21]

Indoor plants keep the air oxygenated, toxin-free, cool and hygienic, and enables physical and mental nourishment. Indoor plants expedite cognition abilities, abate the need for air-conditioning and keeps the ambience invigorated.[9]

Indoor plantation is less likely to jeopardise health by aiding less oxygenated ambience after sunset.[22]

Plants, in addition to other characteristics, act as relievers against frequent physical and psychological illnesses. They enable productivity and proficiency, regulate physiological parameters, and accelerate post-surgery recovery.[23]

Plantation intensifies memory (20%), creativity (45%) and

productivity (38%). It reduces susceptibility to frequent recurrent health issues including runny nose (20%), dry throat (20%), coughing (35%),eye itching (20%), fatigue (30%) and illness (20%).[23] It also averts13 million mortalities annually.[13]

Consumption of vegetables and fruits, the extractions of plantation, enables prevention of incidence and administration of prevalent diseases, assist cure, control or combat against acute or chronic conditions, and facilitates effective remedy without site effects.[12] According to WHO, 5% of gross domestic product (GDP) allocation on health expenditure is preferred for effective healthcare system.[24] Alternatively, $44 health expenditure per capita is recommended.[25] However, health expenses are likely to vary among regions and nations.

Healthy life expectancy, an indicator of health status, is an effective assessor of health outlays. Not necessarily the countries spending the most on healthcare enjoy the greatest healthy prolonged life. Switzerland spends $9674 per capita, but endures 62% more health expense than Japan which is spending $3703 per capita and yet enjoying the longest healthy life span. Similarly, Timor-Leste, China, Suriname, Oman, Russia, Brunei, spending $57, $420, $589, $675, $893, $958 per capita respectively and executing healthy prolonged life expectancies.[4,5] Ghana, Kenya, Sierra Leone, South Africa and Tuvalu spend $58, $78, $86, $570 and $633 per capita respectively and have condensed life spans.[4,5] According to estimates, 10% increase in health outlays accompanies only 3-4 months of added life expectancy.[24,26]

Due to unavailability of data and time constraints, only countries bearing extreme trends for each variable were taken into consideration, which is a limitation of the study and restrict its generalisability. With further availability of sufficient and reliable data, more countries around the globe should be studied.

Conclusion

Growing urbanisation is the biggest threat to ecological resources, ensuing environmental hazards, fauna and flora attenuation, and falling health parameters. Plantation is an effective measure to subdue the effects of various pollutants and to enhance health status.

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