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Pitout JDD, Church DL, Gregson DB, Chow BL, McCracken M, Mulvey M, Laupland KB (2007). Molecular epidemiology of CTXM-producing *Escherichia coli* in the Calgary Health Region: emergence of CTX-M-15-producing isolates. *Antimicrob. Agents Chemother.* 51: 1281-1286.

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ARTICLES

Research Articles

- Community knowledge perceptions and practices regarding malaria prevention and physical environment aspect: A prelude to indoor residual spraying (IRS) implementation in Atacora** 271
Rock Aikpon, Razaki Ossè, Arthur Sovi, Renaud Govoetchan, Frédéric Oké-Agbo and Martin C. Akogbéto
- Microbiology of otitis media among children attending a tertiary hospital in Benin City, Nigeria** 280
Philomena Ikharuonaemi Ogbogu, Nosakhare Odeh Eghafona and Michael Izuwanneka Ogbogu
- Population screening for chronic kidney disease and its associated risk factors: a survey in Hail region, KSA** 285
Ibrahim Abdelmajeed Ginawi, Abdelbaset AM Elsbali, Hussain Gadelkarim Ahmed, Ibraheem M. Ashankyty, Tahani Altamimi, Sharafeldien Alhasan and Awdah M. Al-hazimi
- Yellow fever outbreak in central part of Senegal 2002: Epidemiological findings** 291
M. Diallo, A. Tall, I. Dia, Y. Ba, F. D. Sarr, A. B. Ly, J. Faye, A. Badiane, G. Diakhaby, P. C. Faye, R. Michel, B. Diatta, P. Nabeth, L. Marrama and A. A. Sall
- The promise of the services sector sustainability: A United Arab Emirates (UAE) perspective** 297
khalid Alrawi, Maher Ibrahim, Yacoub Hamdan and Waleed Alrawi

ARTICLES

Research Articles

- The promise of the services sector sustainability: A United Arab Emirates (UAE) perspective** 305
Amresh K. Shrivastava, Megan Johnston, Larry Stitt, Meghana Thakar, Sunita Iyer, Nilesh Shah and David Lester

Full Length Research Paper

Community knowledge perceptions and practices regarding malaria prevention and physical environment aspect: A prelude to indoor residual spraying (IRS) implementation in Atacora region, Benin

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The implementation of a vector control strategy needs to be adapted to both sociocultural and environmental contexts. The determination of National Malaria Control Program (NMCP) to fight effectively against malaria resulted in their decision to implement indoor residual spraying (IRS) in the department of Atacora in the Northwest of Benin. This study assessed community knowledge, perceptions and practices about malaria prevention especially about Indoor Residual Spraying (IRS), as well as data related to the type of human dwellings. Cross-sectional study was conducted between September and October, 2010. The results of a total of 7,878 respondents show little knowledge of populations about malaria. There was however a variety of protective measures against mosquito bites including bednets which are the most used. Moreover, IRS was accepted by 98.74% of respondents. Most (79.84%) of the walls were smooth and lend themselves well to the insecticide treatment.

Key words: Malaria prevention, community, knowledge, perceptions, practices, physical environment aspect, indoor residual spraying (IRS), Benin.

INTRODUCTION

Malaria remains a major cause of morbidity and mortality in sub-Saharan Africa and represents one of the most critical public health challenges for Africa. More than two billion people around the world, particularly people living in South America, South-Eastern Asia and sub-Saharan Africa, are at risk of contracting malaria. Besides, one million deaths are recorded yearly of which, 91% occur in sub-Saharan Africa (WHO, 2011).

In Benin, in 2010, malaria was responsible for more than 1,410 deaths (Ministère de la santé, 2011). However, its incidence in Atacora in 2009 was 16.2%, which is higher than the national average (15.2%).

The fight against malaria aims to significantly reduce the mortality and morbidity linked to it as well as the economic losses it causes. Among the various methods used in the fight against malaria, vector control occupies a prominent place. The use of Insecticide Treated Nets (ITNs) as a method of preventing malaria is widely adopted in most of the strategies already implemented by the national control programs against malaria. Several studies conducted since 1988 so far have demonstrated the effectiveness of ITNs in the fight against malaria, particularly in Burkina Faso (Carnevale et al., 1988; Robert and Carnevale, 1991), Cameroon (Desfontaine et

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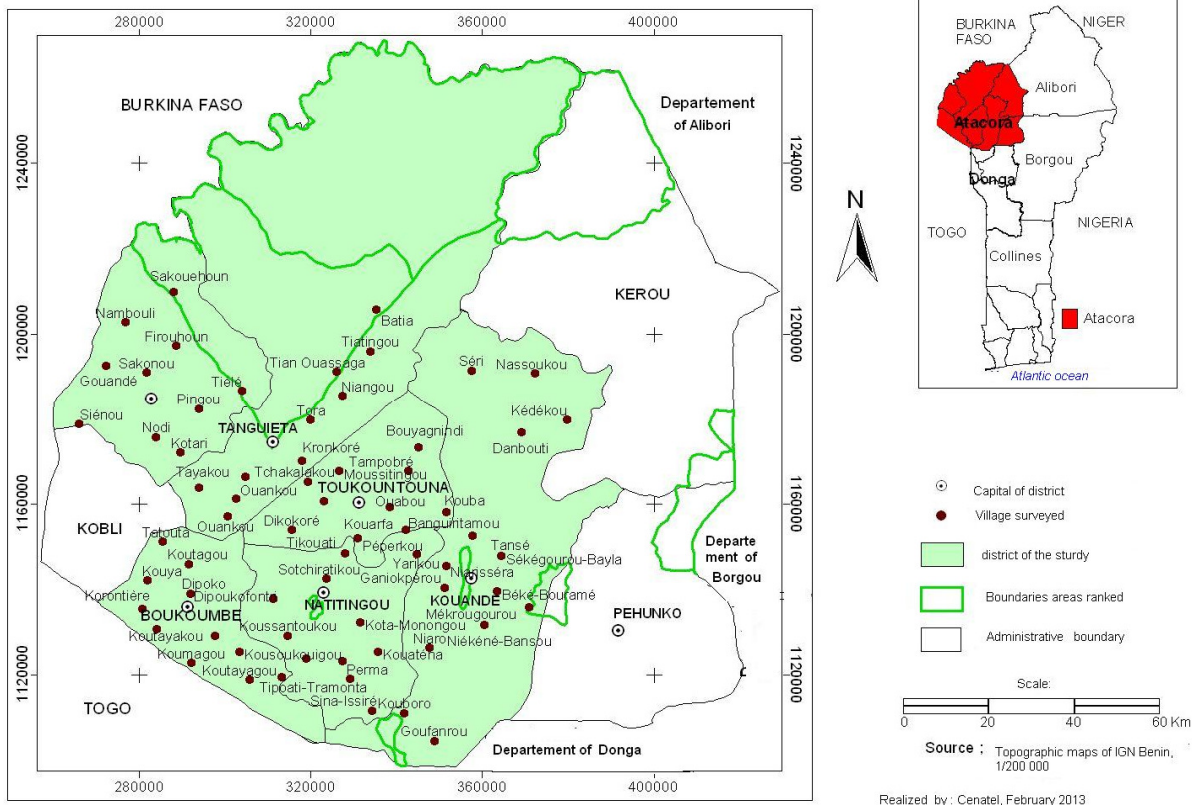


Figure 1. Map of study area.

al., 1990), Gambia (Alonso et al., 1991; D'Alessandro et al., 1995; Cham et al., 1996; Aikins et al., 1998; Snow et al., 1988), Democratic Republic of Congo (Karch et al., 1993), Kenya (Nevill et al., 1996), Ghana (Binka et al., 1996), Benin (Akogbeto et al., 1996) and Côte d'Ivoire (Doannio, 2003; Konan, 2003). Unfortunately, in recent years, the phenomenon of vector resistance to insecticides has been an obstacle to the use of ITNs. The first case of resistance to pyrethroids was highlighted in 1993 in Côte d'Ivoire in natural populations of *Anopheles gambiae* (Elissa et al., 1993). Chandre et al. (1999) confirmed this resistance and showed that it extended to other sub-Saharan countries including Benin. Nowadays, it is present in several countries in central Africa and east Africa (Vulule et al., 1999; Etang et al., 2006; Abdalla et al., 2008; Koekemoer et al., 2002; Nwane et al., 2009). In fact, in Benin, the resistance of malaria vectors to pyrethroids observed first in Cotonou spread not only to central and southern regions of the country, but also to the northern localities (Corbel et al., 2007; Yadouleton et al., 2010). One of the interventions chosen by the National Malaria Control Program (NMCP) to fight against malaria in the context of vector resistance to pyrethroids is a large-scale indoor residual spraying (IRS) using a non-pyrethroids. Then, since 2008, Benin has undertaken a fight against malaria vectors based on IRS like 14 other African countries. A study conducted in Ouémé, in Southern

Benin showed that the first and second rounds of IRS using bendiocarb were successful with a drastic decrease in malaria transmission in areas under IRS (Akogbeto et al., 2011). In view of these performances, the NMCP decided to continue the IRS implementation in other regions of Benin. The second region selected is Atacora.

Elsewhere, the vector control interventions should not only be adapted to the socio-cultural realities of the benefiting population (Kyawt-Kyawt-Swe and Alan, 2004), but also have their agreement. No information was available on communities' knowledge perceptions and practices about IRS. The purpose of this study was therefore to assess community knowledge, perceptions and practices about malaria prevention and especially about IRS. Furthermore, data related to the type of human dwellings were collected. The surveys were conducted between September and October, 2010 in the Department of Atacora before the implementation of the campaign.

METHODOLOGY

Study area

The study was carried out in Atacora, a department located in North-West of Benin (Figure 1). It includes nine districts (Boukoubmé, Kobli, Kérou, Kouandé, Matéri, Natitingou, Péhunco, Tanguiéta, Toukountouan) and covers an area of 31,665 km² with

Table 1. Rates (%) of education level and sex of the population according to districts.

Variable		Boukoumbé		Kouandé		Matéri		Natitingou		Tanguiéta		Toukountounan		Total	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
Sex	Male	601	45.77 ^a	597	45.47 ^a	633	48.21 ^a	692	52.70 ^a	652	49.66 ^a	647	49.28 ^a	3,822	48.51 ^a
	Female	712	54.23 ^b	716	54.53 ^b	680	51.79 ^a	621	47.30 ^a	661	50.34 ^a	666	50.72 ^a	4,056	51.48 ^b
Educational level	Can read and write	429	32.67 ^a	397	30.24 ^a	434	33.05 ^a	511	38.92 ^a	494	37.62 ^a	409	31.15 ^a	2,674	33.94 ^a
	Cannot read and write	884	67.33 ^b	916	69.76 ^b	879	66.94 ^b	802	61.08 ^b	819	62.38 ^b	904	68.85 ^b	5,204	66.05 ^b

N: Number of respondents; Percentage of respondents; Within rows, for a same variable, means followed by the same letter do not differ significantly ($p < 0.05$ chi-square test).

a total of 735,845 inhabitants including 146,309 children under 5 years old in 2011 (INSAE, 2009). This department is characterized by a sub-equatorial climate with only one dry season (December-May) and only one rainy season (July-November). The annual rainfall mean is 1,300 mm and the monthly mean temperatures vary between 23 and 33°C. The major economic activity is agriculture and it is characterized by the production of cotton and millet in areas where various classes of pesticides are used for pest control.

Survey

It is a cross-sectional study, descriptive and analytically based on cluster sampling, conducted between September and October, 2010. The survey consisted of 7,878 individuals including adult male and female heads of household (family unit). The respondent's consent was sought and gained by explaining the aims of the study. The questionnaire contained items on the educational level of the heads of household, their perception regarding mosquito discomfort (bite, malaria), common malaria prevention practices (ITN, IRS) and malaria treatment (traditional medicine and modern antimalarial drugs). During each interview, observations were focused on the type of habitat, wall nature (cement, mud) as well as wall surface (smooth, rough). Subjects who could not or read, write or speak French language were interviewed in their local language. As regards the qualitative interviews, a focus group of thirty people (Krueger, 1994), involving opinion leaders, was conducted in each district to have a better

understanding of people's attitudes, their perception of malaria and how they fight against it.

Sampling

The sampling method used is rational choice method. The sampling fraction was calculated on the basis of 10% of households in Atacora. This resulted in a total of 7,878 households or 7,878 respondents, at the rate of one respondent per household. We chose to conduct the surveys in 2/3 of all districts and that adds up to 6 districts out of 9 with 1313 households surveyed by district regardless of the number of households per district. Actually, these six districts were randomly selected. They include Boukoumbé, Kouandé, Matéri, Natitingou, Tanguiéta and Toukountounan. In each district, the survey was conducted in ten villages. The rational choice method was used in setting the selection criteria of the male or female head of household to be interviewed.

Statistical analysis

Responses and information obtained from the survey were entered in computers using Microsoft Office Excel 2010 of Windows. Then, simple descriptive statistics such as frequency and percentage of variables were computed and cross-tables were produced using SPSS software (16.0 version). A chi-square test for proportion comparison was performed to compare the proportions of each variable related to each region.

RESULTS

Social representations of mosquito and malaria

Females constituted 51.50% ($n = 4,056$) of the 7,878 heads of households that were involved in the survey. Besides, 66.10% of respondents were illiterate (Table 1). The highest illiteracy rate (70.00%) was observed in Matéri. It was noticed that mosquito bite is the most feared mosquito nuisance (55.40%) (Table 2). And only 24.50% of respondents were able to establish the link between mosquitoes and malaria. Knowledge of the cause of malaria was relatively higher in Natitingou (35.11%). Actually, people connect the mosquito's ability to transmit malaria to the notion of dirt. For people, mosquito plays an indirect role in malaria transmission; it walks in wastewater, on rubbish heaps and can therefore transmit malaria by its bite. With regard to the symptoms of malaria, the most mentioned were fever (57.10%), headache (15.00%) and pain (12.60%) (Table 3). 22.70% of people recognized that malaria is a deadly disease. As for malaria treatment, traditional medicine practice (59.00%) was significantly higher than modern medicine practice (41.00%) (Table 3).

Table 2. Perception about mosquito nuisance.

Mosquito nuisance	Boukoubé		Kouandé		Matéri		Natitingou		Tanguiéta		Toukountounan		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Noise	76	5.79 ^a	92	7.01 ^a	81	6.17 ^a	60	4.57 ^a	40	3.05 ^a	101	7.69 ^{ad}	450	5.71 ^a
Bite	779	59.33 ^b	699	53.24 ^b	743	56.59 ^b	716	54.53 ^b	718	54.68 ^b	710	54.07 ^b	4,365	55.40 ^b
Malaria	242	18.43 ^c	276	21.02 ^c	281	21.40 ^c	461	35.11 ^c	369	28.10 ^c	299	22.77 ^c	1,928	24.47 ^c
Insomnia	80	6.09 ^d	96	7.31 ^a	30	2.28 ^d	37	2.82 ^a	83	6.32 ^d	79	6.01 ^d	405	5.14 ^a
Itch	136	10.36 ^e	147	11.19 ^d	176	13.40 ^e	39	2.97 ^a	103	7.84 ^d	124	9.44 ^a	725	9.20 ^d
Any	0	0 ^f	3	0.23 ^e	2	0.15 ^f	0	0 ^d	0	0 ^e	0	0 ^e	5	0.06 ^e

N: Number of respondents; Percentage of respondents; Within rows, means followed by the same letter do not differ significantly ($p < 0.05$ chi-square test).

Table 3. Perceptions and practices of the population related to malaria.

Variable	Boukoubé		Kouandé		Matéri		Natitingou		Tanguiéta		Toukountounan		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Symptom of malaria														
Fever	712	54.23 ^a	699	53.27 ^a	787	59.94 ^a	802	61.08 ^a	724	55.14 ^a	776	59.10 ^a	4,500	57.12 ^a
Pain	229	17.44 ^b	246	18.74 ^b	153	11.65 ^b	129	9.82 ^b	111	8.4 ^b	128	9.748 ^b	996	12.64 ^b
Nausea	80	6.09 ^c	33	2.51 ^c	47	3.58 ^c	51	3.88 ^c	49	3.73 ^c	31	2.36 ^c	291	3.69 ^c
Tiredness	56	4.27 ^{cd}	101	7.69 ^d	106	8.07 ^c	134	10.20 ^b	123	9.37 ^b	132	10.05 ^b	652	8.28 ^d
Headaches	201	15.31 ^b	206	15.69 ^b	199	15.16 ^d	136	10.35 ^b	233	17.74 ^d	206	15.69 ^d	1,181	14.99 ^b
Vomiting	35	2.67 ^d	28	2.13 ^c	21	1.60 ^c	61	4.64 ^c	73	5.56 ^c	40	3.04 ^c	258	3.275 ^c
Perception of the severity of malaria														
Serious	460	35.03 ^b	420	31.98 ^b	387	29.47 ^b	602	45.84 ^a	476	36.25 ^a	419	31.91 ^b	2764	35.08 ^c
Very serious	599	45.62 ^a	612	46.61 ^a	586	44.63 ^a	512	38.99 ^b	513	39.07 ^a	507	38.61 ^a	3329	42.269 ^a
Fatal	254	19.34 ^c	281	21.40 ^c	340	25.89 ^b	199	15.15 ^c	324	24.68 ^c	387	29.47 ^b	1785	22.66 ^b
Medicine used against malaria														
Modern medicine	525	39.98 ^a	501	38.16 ^a	537	40.90 ^a	625	47.60 ^a	510	38.84 ^a	534	40.67 ^a	3232	41.02 ^a
Traditionnal medicine	788	60.01 ^b	812	61.84 ^b	776	59.10 ^b	688	52.40 ^a	803	61.15 ^b	779	59.33 ^b	4646	58.97 ^b

N: Number of respondents; Percentage of respondents; Within rows, for a same variable, means followed by the same letter do not differ significantly ($p < 0.05$ chi-square test).

Experiences and practices of protection against mosquitoes

Among the means of protection, nets are most

commonly used. 34.10% of respondents reported sleeping under ITNs and 20.20%, under ordinary nets. Those possessing no mosquito nets use spirals (mosquito coils) (18.00%) and local plants

(7.24%). In addition, other methods such as the use of insecticide sprays, grids for windows, repellent ointments, cloth for cover, smoke, and fan were reported but in small proportions (Table 4).

Table 4. Measures used by people to fight against mosquitoes.

Measures used	Boukoubé		Kouandé		Matéri		Natitingou		Tanguiéta		Toukountounan		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Impregnated nets	446	33.97 ^a	453	34.50 ^a	402	30.62 ^a	512	38.99 ^a	472	35.94 ^a	399	30.38 ^a	2,684	34.07 ^a
Ordinary nets	299	22.77 ^b	254	19.34 ^b	273	20.795 ^b	246	18.73 ^b	226	17.21 ^b	296	22.54 ^b	1,594	20.23 ^b
Spiral	211	16.07 ^c	241	18.35 ^b	254	19.345 ^b	209	15.91 ^b	263	20.03 ^b	237	18.05 ^c	1,415	17.96 ^b
Spray	80	6.09 ^d	76	5.79 ^{cd}	57	4.3415 ^c	101	7.69 ^c	49	3.73 ^c	62	4.72 ^d	425	5.39 ^{cd}
Local plants	103	7.84 ^d	99	7.54 ^c	117	8.910 ^e	66	5.02 ^d	97	7.38 ^d	88	6.702 ^f	570	7.23 ^c
Smoke	49	3.73 ^e	57	4.34 ^d	76	5.79 ^c	28	2.13 ^e	46	3.50 ^c	61	4.65 ^d	317	4.02 ^d
Ointments	11	0.84 ^f	13	0.99 ^e	19	1.44 ^f	33	2.51 ^e	21	1.60 ^e	22	1.676 ^e	119	1.51 ^e
Window net	17	1.29 ^f	14	1.06 ^e	16	1.22 ^f	46	3.50 ^{ed}	13	0.99 ^e	20	1.52 ^e	126	1.60 ^e
Fan	28	2.13 ^g	19	1.44 ^e	21	1.60 ^f	38	2.89 ^e	15	1.14 ^e	17	1.29 ^e	138	1.75 ^e
Cover	69	5.25 ^d	87	6.63 ^{cd}	75	5.71 ^c	34	2.59 ^e	99	7.54 ^d	102	7.77 ^f	466	5.91 ^{cd}
Any	0	0 ^h	0	0 ^f	3	0.23 ^g	0	0 ^f	12	0.91 ^e	9	0.68 ^g	24	0.30 ^f

N: Number of respondents; Percentage of respondents; Within rows, means followed by the same letter do not differ significantly ($p < 0.05$ chi-square test).

Moreover, during the focus groups, some participants pointed out that they do not use nets because they do not have any, and make a call to the NMCP for free distribution of bed nets to the population.

Experiences and practices regarding protection against mosquitoes

A total of 3,352 (42.50%) of respondents declared that they knew IRS (Table 5). The highest rate was observed in Toukountounan (46.40%) and the lowest in Kouandé (36.00%). 39.40% of the respondents agreed that IRS contributes to the reduction of mosquitoes (Table 5). But only 18.80% of them associated the reduction of malaria transmission to IRS. Although 68.40% of the respondents found no drawback to IRS, others fear odors (12.80%) that could be released by the pesticides and their toxicity (13.70%) (Table 5). As to the acceptability of IRS, there is a strong

adhesion of the populations. As a matter of fact, 98.70% gave their accession to the IRS campaign. And the same observation was made in focus groups. The populations also suggested that IRS campaign should be implemented during the rainy season when mosquitoes "disturb" a lot.

Physical nature of the various types of dwelling

In the 6 districts, it was noticed that human dwellings are mostly built with mud (Figure 2). And, out of the 6,600 dwellings surveyed, 87.66% were built with mud (Figure 3) and the majority of them (79.84%) had their walls plastered (Figure 4). In all districts, there was a very low number of cement walls (12.33%) (Figure 5). But Natitingou was characterized by the most modern habitat with the highest proportion of cement houses (33.00%). Most of the plastered cement walls and mud walls (82.33%) were smooth with surfaces

that lent themselves well to insecticide treatment. The walls with rough surfaces (17.66%) were essentially those that were not plastered.

DISCUSSION

The results of this study show that the majority of respondents have little knowledge about the cause of malaria. It was remarked that only 24.50% could relate malaria to mosquito bites. This low knowledge level regarding the cause of malaria confirms the results of previous works in Nigeria (Okeke and Okafor, 2008), Cameroon (Shey et al., 2011) and Benin (Padonou et al., 2011) in similar environments to Atacora. This could be explained by the culture of the communities who consider sun as a major cause of malaria. As a matter of fact, in the local language bariba, malaria is called "som Bararou" meaning "sun disease". However, in the same culture, there is a second name for malaria "bougain

Table 5. Perceptions and acceptability of populations for IRS.

Parameter	Boukoubé		Kouandé		Matéri		Natitingou		Tanguiéta		Toukountounan		Total		
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
Knowledge of IRS	Know	525	39.99 ^a	472	35.95 ^a	576	43.87 ^a	601	45.77 ^a	569	43.34 ^a	609	46.39 ^a	3.352	42.55 ^a
	Do not Know	788	60.01 ^b	841	64.05 ^b	737	56.13 ^b	712	54.23 ^b	744	56.66 ^b	704	53.61 ^b	4.526	57.45 ^b
IRS disadvantage	Any	925	70.45 ^a	912	69.46 ^a	899	68.47 ^a	714	54.38 ^a	1021	77.76 ^a	916	69.76 ^a	5.387	68.38 ^a
	Bad odor	103	7.84 ^b	116	8.83 ^b	142	10.81 ^b	306	23.30 ^b	163	12.41 ^b	177	13.48 ^b	1.007	12.78 ^b
	Toxic	199	15.16 ^c	186	14.16 ^c	195	14.85 ^c	201	15.31 ^c	127	9.67 ^b	168	12.79 ^b	1.076	13.66 ^b
	Do not Know	86	6.55 ^b	99	7.54 ^b	77	5.86 ^d	92	7 ^d	2	0.15 ^c	52	3.96 ^c	408	5.18 ^c
IRS advantage	Reduction of disease	246	18.73 ^a	251	19.12 ^a	261	19.88 ^{ad}	271	20.64 ^a	128	9.75 ^a	273	20.79 ^a	1.430	18.15 ^a
	Reduction of malaria	236	17.97 ^a	222	16.91 ^a	231	17.59 ^a	256	19.49 ^a	273	20.79 ^b	265	20.18 ^a	1.483	18.82 ^a
	Réduction of mosquitoes	512	38.99 ^b	499	38 ^b	501	38.15 ^c	484	36.86 ^b	602	45.85 ^c	503	38.30 ^b	3.101	39.36 ^b
	Reduction of insects	316	24.07 ^a	335	25.51 ^c	304	23.15 ^d	299	22.77 ^a	310	23.61 ^b	269	20.48 ^a	1.833	23.27 ^c
	Don't know	3	0.23 ^c	6	0.45 ^d	11	0.84 ^e	3	0.23 ^c	0	0 ^d	2	0.15 ^c	25	0.37 ^d
	Others	0	0 ^c	0	0 ^d	5	0.38 ^e	0	0 ^c	0	0 ^d	1	0.078 ^c	6	0.08 ^e
IRS acceptance	Yes	1.299	98.93 ^a	1301	99.09 ^a	1.296	98.71 ^a	1.279	97.41 ^a	1.304	99.32 ^a	1.300	99.01 ^a	7.779	98.74 ^a
	NO	14	1.06 ^b	12	0.91 ^b	17	1.29 ^b	34	2.59 ^b	9	0.68 ^b	13	0.99 ^b	99	1.26 ^b

N: Number of respondents; Percentage of respondents; Within rows, for a same variable, means followed by the same letter do not differ significantly ($p < 0.05$ chi-square test).

Bararou" which means "mosquito disease". This shows that within the same culture, the knowledge of the cause of malaria is heterogeneous. These results suggest then the need to develop an Information, Education and Communication (IEC) program on malaria to allow the populations to know this disease better so as to fight against it effectively. The poor knowledge of the causes of malaria is also linked to the illiteracy of a great deal of people in Atacora. In the present study, 55.40% of the respondents mentioned the bite as a main mosquito nuisance. The same thing was noticed during a survey conducted in Bouake where painful stings and noises preventing from sleeping well were reported as the major mosquito nuisances (Doannio et al., 2004).

There is a range of protective measures against mosquito bites. Although, nets are the most used means of protection (54.30%), the rate of net coverage remains low. And even within households where net use is reported, it is not available to all members. The populations pointed out that they got the majority of their nets from free distribution campaigns since their purchasing power is so limited that they cannot afford nets. This reminds earlier surveys carried out in Northern Ghana which showed that "cost" is one of the key factors that may influence the dissemination and effectiveness of bednets (Binka and Adongo, 1997). The second most commonly used means of protection against mosquitoes is the use of coils. This could be explained by the

availability of coils on all markets, their relatively low cost and the fact that they could be bought on retail basis. As for the repulsive gas plants, they are rarely used (7.24%) probably because of their short term effectiveness.

Indeed, the high rate of acceptability of IRS could be explained first, by the great experience the populations have in terms of home treatment, secondly, by the promotion of preventive measures against malaria and finally the comparison populations make between the effectiveness of phytosanitary treatments and IRS. However, some people distrust the toxicity of insecticides and their odors. But, a good sensitization will surely reduce this reluctance. As for the treatment of malaria, 59.00% of the respondents use traditional

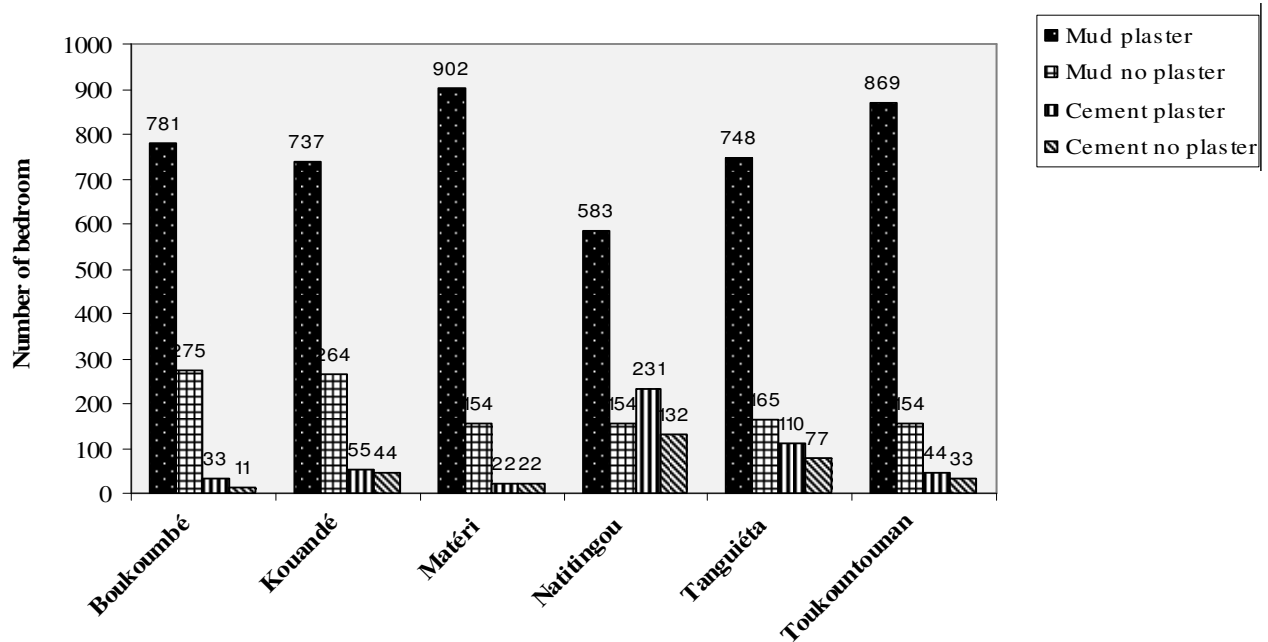


Figure 2. Numbers of habitat types noticed in each district.



Figure 3. Mud plaster habitat in Tanguiéta. Source: Aïkpon (2010).

traditional medicine. And, this could be explained not only by the low purchasing power of the population to afford drugs, but also by a lack of health facilities obliging patients to travel long distances before accessing the closer health center. The large number of houses built with mud (87.66%) is justified by the low standard of living. This type of wall could require the use of large quantities of insecticides during spraying due to its high porosity. There is, however, a high rate of plastering (79.84%),

often with a mixture of sand and/or debris of Néré (African tree from the family of *Mimosaceae*). This smooths the surface of the walls and may reduce the porosity so as to provide bioavailability of the insecticide on the surface of the walls. Indeed, a smooth surface is an advantage for the effectiveness of IRS (Najera and Zaim, 2004).

This survey was conducted in a community that had not yet been directly mobilized or educated about IRS, nor



Figure 4. Mud plaster habitat in Tanguiéta.
Source : Aikpon (2010).



Figure 5. Cement plaster habitat in Natitingou.
Source : Aikpon (2010).

did it explore actual experiences with use of IRS. Hence, this survey may not be able to differentiate between the real experiences and anticipated fears of IRS use. Nevertheless, the survey highlights significant community concerns about IRS that should be associated with sensitization to ensure success of such a programme.

Conclusion

The study of social representations and practices as far as malaria is concerned in the Department of Atacora shows that the respondents have little knowledge about the cause of malaria. There is, however, knowledge of preventive measures against mosquitoes. But, despite the diversity of prevention tools against mosquito bites,

bed nets are the most used. Although the majority of respondents had positive perceptions, a little proportion had negative perceptions towards the use of IRS. Therefore to ensure householders' cooperation and participation in the IRS processes in order to achieve a successful IRS programme, sensitization is needed, prior to introduction of IRS to address the identified knowledge gaps and poor perceptions about it.

Moreover, the majority of the walls are plastered with mud or cement, offering treatable smooth surfaces.

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Full Length Research Paper

Microbiology of otitis media among children attending a tertiary hospital in Benin City, Nigeria

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Otitis media has a worldwide prevalence. Though it is more common in children, the aetiologies and antibiogram varies with age, time and geographical location. A total of 220 children less than 18 years with signs and symptoms of otitis media were recruited for this study. Middle ear discharge were collected, processed and microbial isolates identified using standard microbiological techniques. Disc susceptibility tests were performed on bacterial isolates. Gender and age did not significantly affect the prevalence of otitis media pathogens ($P = 0.8310$ and $P = 0.8272$, respectively). *Pseudomonas aeruginosa* (33.33%) were the most prevalent microbial agent of otitis media followed by *Staphylococcus aureus* (23.19%) while *Citrobacter* species and *Aspergillus niger* were the least prevalent with a prevalence of 0.48% each. In relation to gender, *P. aeruginosa* were the most prevalent followed by *S. aureus* in males. In females, *S. aureus* (32.18%) predominated. Only *S. aureus* was significantly associated with female gender (odd ratio (OR) = 2.422 95% confidence interval (CI) = 1.261, 4.65, $P = 0.0113$). Tetracycline, erythromycin, cloxacillin and amoxicillin were poorly active against the bacterial isolates. Other antibacterial agents exhibited good activity against the bacterial isolates. In conclusion, an overall prevalence of 84.55% of culture-positive otitis media was observed in this study with *P. aeruginosa* as the predominant aetiological agent. Though, the antibacterial agents exhibited good activities, prudent use of antibacterial agents are advocated.

Key words: Otitis media, children, tertiary hospital, Benin City.

INTRODUCTION

Otitis media is defined as the inflammation of the middle ear and is a common cause of children's visit to physicians (Li et al., 2001). The disease may be acute or chronic, suppurative and is usually recurrent. Otitis media is reported to be prevalent worldwide (Egbe et al., 2010) with an estimated direct and indirect cost of diagnosis and management exceeding 5 billion dollars annually (Alsharaf et al., 1999).

Otitis media affects all age groups, but is more common in children (Li et al., 2001). The lower immunity (of children as compared to adult, the shorter and more horizontal Eustachian tube in children which permits easier access of microorganisms from the nasopharynx, and the fact that bacteria adhere better to epithelial cells of children than adults, have been suggested as possible reasons for the higher prevalence in children (Shimanura

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Table 1. Prevalence of otitis media in relation to gender and age.

Characteristic	No. tested	No. positive (%)	OR	95% CI	P value
Gender					
Male	129	108 (83.72)	0.8571	0.4046, 1.816	0.8310
Female	91	78 (85.71)			
Mixed infections					
Gender					
Male	129	12 (9.30)	0.9345	0.3764, 2.320	0.8838
Female	91	9 (9.89)			
Age (year)					
< 1 – 3	116	100 (86.21)	-	-	0.8272
4 – 6	45	37 (82.22)			
7 – 9	18	16 (88.89)			
10 – 12	15	12 (80.00)			
13 – 15	11	8 (72.73)			
16 – 18	13	(86.67)			

OR = Odd ratio; CI = confidence interval.

et al., 1990; Li et al., 2001). Other risk factors for otitis media include exposure to smoke, crowded living conditions and low socio-economic class (Li et al., 2001; Aich et al., 2009). These conditions are rife in resource-poor countries like Nigeria.

Aetiologic agents of otitis media include bacteria, fungi and viruses (Li et al., 2001), though bacterial agents of otitis media depends on age of individuals, geographical location and whether the infection is acute and chronic (Ogisi and Osamor, 1982; Herzon, 1992). Treatment is very necessary and urgent to prevent complications such as meningitis, septicaemia, amongst others (Schurtzman et al., 1991; Herzon, 1992). Therefore, periodic review of aetiologic agents of otitis media and their antimicrobial susceptibility profiles is warranted especially in this era of increasing microbial resistance. This study aims to determine the prevalence of otitis media among children, the effect of age and gender on this prevalence as well as determine the aetiologic agents and the susceptibility profiles of bacterial agents.

MATERIALS AND METHODS

Study population

The study was conducted at the University of Benin Teaching Hospital, Benin City, Nigeria. The hospital is a tertiary institution with a referral status. A total of 220 (129 males and 91 females) children less than 18 years with signs and symptoms of otitis media attending ear, nose and throat clinics in the hospital were included in this study. Patients on antibacterials within 7 days prior to specimen collection were excluded. Informed consent was obtained from parents or guardians of all children prior to specimen collection. Ethical approval for the study was obtained from the

Ethics and Research Committee of the University of Benin Teaching Hospital.

Specimen collection and processing

Two sterile swabs were used to collect ear discharges from each patient. All specimens were transported to the laboratory and analyzed within 1 h of collection. One of the swabs was inoculated onto chocolate, blood and MacConkey agar plates. All plates were incubated aerobically at 37°C for 24 to 48 h except the chocolate agar plates that were incubated in a candle jar. The second swab was inoculated onto 2 Sabouraud agar plates. One was incubated at ambient temperature for 72 h and the other at 37°C for 24 h.

Emergent bacterial colonies were identified by standard bacteriological techniques (Barrow and Teltham, 2003), and disc susceptibility test performed by the BSAC method (Andrews, 2009).

All yeast isolates were identified with CHROMagar™ candida (Paris, France) (Paritpokee et al., 2005) and filamentous fungi were identified as previously described (Rippon, 1974).

Statistical analysis

The data were analyzed with Chi Square (χ^2) test and odd ratio analysis using the statistical software INSTAT® (GraphPad Software Inc., La Jolla, CA, USA).

RESULTS

A total of 186 (84.55%) out of the 220 patients were culture-positive. Although females (85.71%) had higher prevalence of culture-positive otitis media than their male counterparts (83.72%), the difference was not statistically significant ($P = 0.8310$). In a similar vein, the prevalence of mixed infections did not differ significantly between male and female genders ($P = 0.8838$) (Table 1).

Table 2. Distribution of microbial agents of otitis media in relation to gender.

Organism	Male (%)	Female (%)	Total (%)
<i>Escherichia coli</i>	3 (2.50)	2 (2.30)	5 (2.42)
<i>Klensiella</i> species	11 (9.17)	4 (4.60)	15 (7.25)
<i>Enterobacter</i> species	2 (1.67)	2 (2.30)	4 (1.93)
<i>Citrobacter</i> species	1 (0.83)	0 (0.00)	1 (0.48)
<i>Proteus vulgaris</i>	3 (2.50)	5 (5.75)	8 (3.86)
<i>Proteus mirabilis</i>	12 (10.00)	11 (12.64)	23 (11.11)
<i>Providencia</i> species	4 (3.33)	4 (4.60)	8 (3.86)
<i>Acinetobacter</i> species	5 (4.17)	2 (2.30)	7 (3.38)
<i>Alcaligenes</i> species	3 (2.50)	2 (2.30)	5 (2.42)
<i>Pseudomonas aeruginosa</i>	47 (39.17)	22 (25.29)	69 (33.33)
<i>Staphylococcus aureus</i> *	20 (16.67)	28 (32.18)	48 (23.19)
<i>Candida albicans</i>	8 (6.67)	5 (5.75)	13 (6.28)
<i>Aspergillus niger</i>	1 (0.83)	0 (0.00)	1 (0.48)
Total	120 (57.97)	87 (42.03)	207 (100.0)

*Female vs. male: OR = 2.422 95%; CI = 1.261, 4.651; P = 0.0113.

The prevalence of culture-positive otitis media decreased from 86.21% in the age range of <1 to 3 years to 72.73% in the age range of 13 to 15 years and then increased to 86.67% in the age range of 16 to 18 years. However, age did not significantly affect the prevalence of culture-positive otitis media ($P = 0.8272$) (Table 1).

A total of 207 microbial isolates were recovered in this study. *Pseudomonas aeruginosa* (33.33%) were the predominant isolate causing otitis media. This was followed by *Staphylococcus aureus* (23.19%) while *Citrobacter* species and *Aspergillus niger* were the least aetiologic agent of otitis media with a prevalence of 0.48% each. In relation to gender, *P. aeruginosa* were the most common in males while *S. aureus* were the most common in females and only *S. aureus* was significantly associated with gender (odd ratio (OR) = 2.422 95% confidence interval (CI) = 1.261, 4.651; $P = 0.0113$) (Table 2).

The flouroquinolones showed moderate to good activity against all bacterial isolates. Erythromycin and tetracycline showed poor activity while gentamicin showed good activity against all bacterial isolates with the exception of *Escherichia coli*. Depending on the β -lactam, their activity against the bacterial isolates ranged from poor to good with imipenem being the most active (Table 3).

DISCUSSION

Risk factors for otitis media-exposure to smoke, crowded living conditions, low socio-economic class, malnutrition, poor hygiene, inadequate health care and recurrent

upper respiratory tract infection (Li et al., 2001; Aich et al., 2009; Prakash et al., 2013), are rife in resource-poor settings. Children have been reported to be at higher risk (Li et al., 2001). Bacterial agents of otitis media and their antibiogram vary with age, geographical location, whether the infection is acute or chronic and time (Ogisi and Osamor, 1982; Herzon, 1992; Hassan and Adeyemi, 2007). Thus, necessitating periodic reviews to optimize treatment in order to prevent serious complications such as meningitis, septicaemia, intracranial abscess, etc (Prakash et al., 2003). Against this background, this study was conducted.

An overall prevalence of 84.55% of culture-positive otitis media was observed in this study. This prevalence was higher than previous studies in advance countries (Giebink, 1989; Maharjan et al., 2006). It has been reported that the prevalence of otitis media is higher in developing countries when compared with advanced countries and inaccessibility to health care facility, local customs and beliefs, harmful traditional practices and poor treatment of acute cases by the first contact health personnel have been suggested as possible reasons for the difference in prevalence (Lasisi and Ajuwon, 2001; Lasisi et al., 2002; Lasisi, 2008). However, the prevalence in this study is lower than that reported in Nigeria (95.5%) (Nwabaisi and Olige, 2002) and India (91.2%) (Prakash et al., 2013).

It is important to note that 15.45% of the specimens processed were culture-negative. Anaerobic bacteria, viruses, *Chlamydia trachomatis* and *Mycoplasma pneumonia* have been reported as possible pathogens of the middle ear (Block, 1998; Chonmaitree, 2000; Prakash

Table 3. Susceptibility profiles of bacterial agents of otitis media.

Organism	Antibacterial agents (µg/disc)										
	AMX (30)	AUG (30)	CRO (30)	CAZ (30)	IPM (10)	OB (5)	CN (10)	TE (10)	E (10)	CIP (5)	OFX (5)
<i>Escherichia coli</i> (n=25)	0 (0.0)	1 (5.0)	0 (0.0)	0 (0.0)	5 (100.0)	ND	0 (0.0)	0 (0.0)	ND	5 (100.0)	4 (80.0)
<i>Klensiella</i> species (n=15)	0 (0.0)	14 (93.3)	11 (73.3)	12 (80.0)	15 (100.0)	ND	13 (86.7)	1 (6.7)	ND	15 (100.0)	13 (86.7)
<i>Enterobacter</i> species (n=4)	0 (0.0)	3 (75.0)	4 (100.0)	4 (100.0)	4 (100.0)	ND	3 (75.0)	0 (0.0)	ND	4 (100.0)	4 (100.0)
<i>Citrobacter</i> species (n=1)	1 (100.0)	1 (100.0)	1 (100.0)	1 (100.0)	1 (100.8)	ND	1 (100.0)	0 (0.0)	ND	1 (100.0)	1 (100.0)
<i>Proteus vulgaris</i> (n=8)	0 (0.0)	0 (0.0)	8 (100.0)	8 (100.0)	8 (100.0)	ND	8 (100.0)	0 (0.0)	ND	7 (87.5)	8 (100.0)
<i>Proteus mirabilis</i> (n=23)	0 (0.0)	0 (0.0)	18 (78.3)	20 (87.0)	22 (95.7)	ND	19 (82.6)	0 (0.0)	ND	21 (91.3)	14 (60.9)
<i>Providencia</i> species (n=8)	0 (0.0)	6 (75.0)	5 (62.5)	6 (75.0)	8 (100.0)	ND	6 (75.0)	0 (0.0)	ND	2 (40.0)	5 (62.5)
<i>Acinetobacter</i> species (n=7)	0 (0.0)	5 (71.4)	7 (100.0)	7 (100.0)	7 (100.0)	ND	7 (100.0)	0 (0.0)	ND	5 (71.4)	5 (71.4)
<i>Alcaligenes</i> species (n=5)	0 (0.0)	3 (60.0)	5 (100.0)	5 (100.0)	5 (100.0)	ND	5 (100.0)	0 (0.0)	ND	2 (40.0)	2 (40.0)
<i>Pseudomonas aeruginosa</i> (n=69)	0 (0.0)	4 (5.8)	60 (87.0)	66 (95.7)	68 (98.6)	ND	50 (72.5)	0 (0.0)	ND	66 (95.7)	58 (84.1)
<i>Staphylococcus aureus</i> (n=48)	10 (20.8)	38 (79.2)	38 (79.2)	39 (81.3)	44 (91.7)	22 (45.8)	38 (79.2)	0 (0.0)	15 (31.3)	45 (93.8)	44 (91.7)

n = number tested; AMX = amoxicillin; AUG = amoxicillin – clavulanate; CRO = ceftriaxone; CAZ = ceftazidime; IPM = Imipenem; OB = cloxacillin; CN=gentamicin; TE = tetracycline; E= erythromycin; CIP = ciprofloxacin; OFX = ofloxacin. Figures in parenthesis are in percentages.

et al., 2013). Specimens in this study were not processed to recover these agents.

Polymicrobial infections are common in otitis media (Grebink, 1989; Chonmaitree, 2000) with mixed bacteria-bacteria and viral-bacteria infections commonly reported (Chonmaitree et al., 1986; Giebink, 1989; Jero and Karma, 1997). In this study, 9.55% of processed specimen were observed to be polymicrobial with bacteria-bacteria and bacteria-fungi infection observed.

The finding that gender did not significantly affect the prevalence of otitis media agrees with previous reports (Bluestone et al., 1992; Li et al., 2001) but disagrees with the report of Koksai and Reisli (2002). These conflicting findings have been noted recently, but the authors remarked that there were no anatomical differences in the ear structures of males and females (Prakash et al., 2013). This may explain the findings in this study.

The effect of age on the prevalence of otitis media varies from one study to the other. Some authors report that children less than 6 years to be more at risk of otitis media (Li et al., 2001), others report the age bracket of 13 to 15 years to have higher prevalence of otitis media (Maharjan et al., 2006). This study did not show any significant effect of age on the prevalence of otitis media. Perhaps children less than 18 years of age may not show age-related difference in the prevalence of otitis media. Indeed, Prakash et al. (2013) reported the prevalence of otitis media to be higher within the age range of 0 to 20 years.

The findings that *P. aeruginosa* was the most predominant isolate causing otitis media agrees with previous reports from Nigeria (Nwabuisi and Ologe, 2002; Oguntibeju, 2003) but differs from studies in developed countries where *Streptococcus pneumoniae*, *Haemophilus*

influenzae and *Moraxella catarrhalis* predominate (Li et al., 2001; Koksai and Reisli, 2002). This may be due to geographical location which has been reported as one of the factors that determine bacterial agents of otitis media (Ogisi and Osamor, 1982; Herzon, 1992).

Irrespective of the type of bacterial isolates, fluoroquinolones, imipenem, third generation cephalosporins and gentamicin (with the exception of *Escherichia coli*) were the most active antibacterial agents. Fluoroquinolones are contraindicated in children (Egbe et al., 2011), gentamicin is toxic to patients with renal impairment while imipenem and the third generation cephalosporins (Ceftraxome and ceftazidime) are expensive. Therefore, prudent use of antibacterial agents is advocated.

In summary, an overall prevalence of culture-positive otitis media of 84.5% was observed in this

study. *P. aeruginosa* was the most predominated aetiologic agent of otitis media and rational use of antibacterial agents is advocated.

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Full Length Research Paper

Population screening for chronic kidney disease and its associated risk factors: a survey in Hail region, KSA

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Early identification of chronic kidney disease (CKD) provides valuable opportunities for effective interventions that reduce the risk of outcomes particularly renal failure and cardiovascular disease. The aim of this study was to screen the local population for CKD to identify potential risk factors for its development. Screening for CKD was performed involving 299 individuals aged over 15 year-old subjects in a cross sectional survey. Participants completed a questionnaire, clinical examination (diabetes and hypertension) and were then referred for laboratory investigations (creatinine, urea, uric acid and urine protein) for CKD and other potential risk factors (including diabetes and hypertension). CKD was identified in 70/299 (24%), of whom 27/70 (38.6%) were males and 43/70 (61.4%) were females, 49/70 (70%, $P=0.001$) were cases of diabetes, while 45/70 (64.3%, $P=0.001$) were with hypertension. This preliminary study provided information on the frequency of CKD and its associated risk factors in the Hail region. However, larger population needs to be screened to establish the role of these risk factors in the etiology of CKD in Hail region.

Key words: Hail, chronic kidney disease (CKD), hypertension, diabetes, congestive heart failure (CHF).

INTRODUCTION

Chronic kidney disease (CKD) is defined by the National Kidney Foundation (2002) as either a decline in glomerular filtration rate (GFR) to <60 ml/min/1.73 m² or the presence of kidney damage for at least 3 months. Signs of kidney damage classically include proteinuria, but other markers of damage, such as persistent glomerulonephritis or structural damage from polycystic kidney disease can also be present (Murphree and Thelen, 2010).

Early identification of CKD is a legitimate enterprise if it provides meaningful opportunities for effective and safe interventions that reduce the risk of death, end-stage renal disease, or complications of renal dysfunction (Richard and Christopher, 2008). Progression of CKD in the presence of definite disease, particularly in the presence of certain diseases such as micro albuminuria, can

be modified by interventions with the use of inhibitors of angiotensin II; however, the evidence that such approaches can alter the progression of stage 3 CKD in the absence of other definitive features of kidney damage has not yet been proven (Richard and Christopher, 2008).

Regardless of the underlying etiology of the CKD, the family physician can make a significant impact in slowing the progression of chronic kidney disease through strict blood pressure control, tight glycemic control, reduction in the degree of proteinuria, and smoking cessation. All chronic kidney disease patients are at significantly increased risk of cardiovascular events; therefore, additional cardiovascular risk factors such as hyperlipidemia shall also be managed aggressively (Murphree and Thelen, 2010).

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With the adoption of Western lifestyle in addition to the genetic factors, the population in Hail which has the maximum percentage of obesity in the Kingdom (Othaimen et al., 1993), and could pose greater risk of developing diabetes mellitus (DM) hypertension and CKD. In the present study, the population for CKD and its associated risk factors have been screened preliminary.

MATERIALS AND METHODS

This is a cross sectional survey that included data from 299 Saudis from general population during the period of October 2012 to December 2012. A team of professionals and volunteers assisted in collection of data from two cities (Om-Alglban and Al-Qaed) in the Hail region, KSA.

Before CKD screening campaign, the professionals were given instructions to standardize data collection and procedures. Data were collected by the qualified physicians utilizing a standard questionnaire, which included demographic information, previously diagnosed diseases (hypertension, kidney and cardiovascular diseases, diabetes and others) and familial history of hypertension, diabetes, kidney, kidney stones, urinary tract infection, cardiovascular diseases, analgesic abuse and herbal use.

After the questionnaire, each participant underwent a physical examination with the measurement of height and weight for counting the body mass index (BMI). The results of diagnostic tests performed at that time (urine dipstick, capillary blood glucose) as well as blood pressure levels were also recorded.

Regardless of urinary abnormalities (such as infection, etc) or risk factors for CKD, these people with such conditions were referred to local health centres and they were identified and informed about the planned screening for their consent.

A dipstick test (ChoiceLine 10; Roche Diagnostics Ltd, UK) was performed to check the presence of albumin and erythrocytes/haemoglobin in the urine samples. This procedure was performed immediately after the urine sample was brought by each participant. Dipstick was read manually by a group of professionals trained for this purpose, and final result of each reagent strip was confirmed by two of them, as they worked in pairs. They followed a standardized procedure, according to the instructions provided by the manufacturer, including the use of a stopwatch with countdown timer. In addition, traces of proteinuria were not considered as an abnormal result for this study purpose, and a supervisor was available whenever there was any doubt. In fact, proteinuria and haematuria were defined by a reading of 1+ or more of protein or blood on dipstick.

Diagnosis of hypertension was based on the observation of blood pressure levels superior to 140/90 mmHg. Prehypertension is considered to be blood pressure readings with a systolic pressure from 120 to 139 mmHg or a diastolic pressure from 80 to 89 mmHg.

Diagnosis of diabetes in this survey was based on the information provided by the participant of being under treatment for diabetes due to a previous well-established diagnosis, then confirmed with new blood glucose estimation. We considered the participants as suspicious of having diabetes if non-fasting results of blood glucose were >200 mg/dl. Creatinine, urea, and uric acid were subsequently measured.

GFR was calculated using GFR calculator (Safe Kidney Care, available at: http://www.safekidneycare.org/healthcare_provider_gfr_calc.php). All individuals with a GFR <60 ml/min/1.73 m², were regarded as having CKD and further classified into the following stages: stage I: mild reduction in GFR (30 to 59 ml/min/1.73 m²); stage II: moderate reduction in GFR (16 to 29 ml/min/1.73 m²), and stage III: severe reduction in GFR (30 to 59 ml/min/1.73 m²).

RESULTS

In the present study, 299 apparently healthy individuals were investigated for the presence of CKD and its related risk factors. The age of the participants ranged from 15 to 100 years with a mean age of 43±5 years. The male female ratio was 1.00:1.85. Of the 299 full respondents, 70/299 (24%) were found with different stages of CKD. High levels of CKD risk factors were identified in varying proportion among the study population. Systolic blood pressure (BP), diastolic BP, DM, creatinine, urea, and uric acid were identified in 111/299 (37%), 79/299 (26.4%), 77 (26%), 15/299 (5%), 23/299 (8%) and 12/299 (4%), respectively, as indicated in Figure 1.

Of the 70 cases of CKD, stage III, stage II and stage I were identified in 5/70 (7.14%), 21/70 (30%) and 44/70 (62.86%), respectively. According to gender, CKD did not show statistically significant difference, as indicated in Table 1. For the age, CKD was found to increase with the increase of age and this was found to be statistically (P=0.000), as shown in Table 1. For the education, CKD was found to be inversely associated with level of education. Most affected were among less educated participants (P=0.000), indicated in Table 1. CKD was found to be statistically significant with all occupations except for the students. Notably, the more advanced stages of CKD were frequently seen among housewives followed by employees, as indicated in Table 1.

Figure 2 describes the association between risk factors for CKD and different stages of CKD. Hypertension was identified among 4 (80%), 14 (67%) and 13 (30%) of those with stage III, stage II and stage I CKD, respectively (P<0.00001). DM was identified among 3 (60%), 14 (67%) and 15 (36%) of those with stage III, stage II and stage I CKD, respectively (P<0.00001). Stroke was identified among 2 (40%), 3 (14%) and 2 (4.5%) of those with stage III, stage II and stage I CKD, respectively (P<0.00001). Heart attack was experienced among 1 (20%), 6 (28%) and 4 (9%) of those with stage III, stage II and stage I CKD, respectively (P<0.00001). CHF was found among 1 (20%), 2 (10%) and 1 (2.3%) of those with stage III, stage II and stage I CKD, respectively (P<0.002). Recurrent Urinary tract infection (UTI) was found among 1 (20%), 8 (38%) and 26 (59%) of those with stage III, stage II and stage I CKD, respectively (P<0.004). Renal stone was identified among 1 (20%), 0 (0%) and 9 (20%) of those with stage III, stage II and stage I CKD, respectively (P<0.328). These results showed no statistical difference between the findings and the population without CKD.

As summarized in Table 2, for systolic BP, prehypertensive and hypertensive cases were identified among (2 and 3), (4 and 9), (20 and 20) and (34 and 19) of stage III, stage II, stage I CKD, and non-CKD in this order (P<0.008), hence, for diastolic BP, prehypertensive and hypertensive cases were identified among (0 and 3), (3 and 7), (7 and 36) and (10 and 13) of stage III, stage II, stage I CKD, and non-CKD in this order (P<0.03).

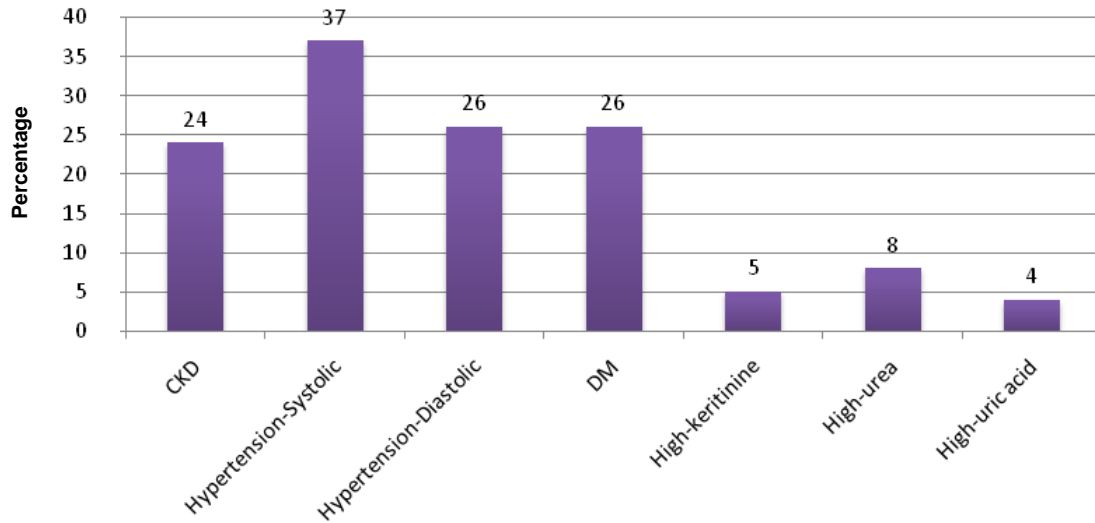


Figure 1. Description of the study population by CKD, hypertension, DM, creatinine, urea and uric acid.

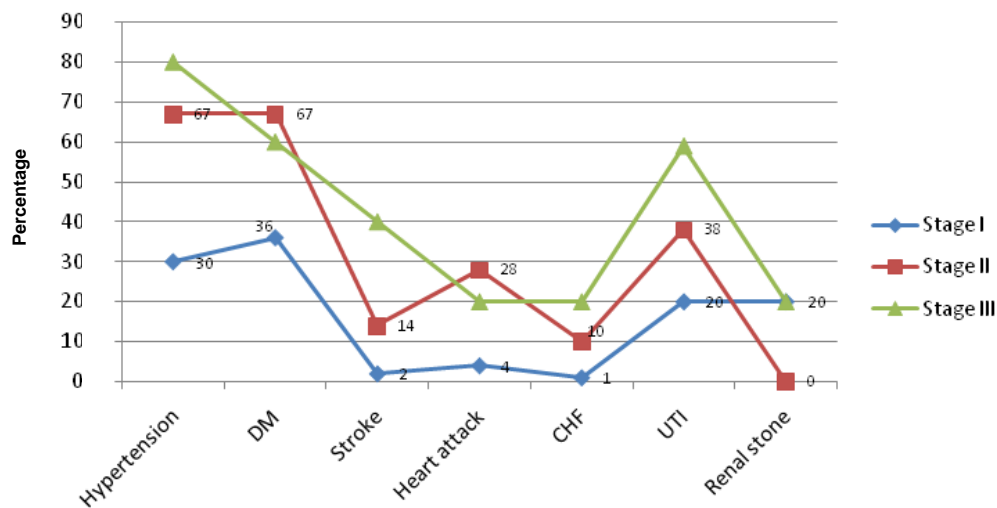


Figure 2. Description of risk factors by CKD.

Furthermore, high creatinine, urea and uric acid were found among (5, 5 and 5), (10, 9 and 5), (0, 4 and 1) and (0, 3, and 2) of stage III, stage II, stage I, and non-CKD, respectively with P values of 0.04,0.06 and 0.321 for creatinine, urea and uric acid correspondingly, as indicated in Table 2.

As shown in Figure 3, majority of individuals with CKD have shown increased percentages of CKD risk factors and the proportional increase was related with the increasing of severity of the stage of CDK.

DISCUSSION

CKD is progressively more frequent in public health

concern related to considerable morbidity and mortality. Evaluation of the problem magnitude, through identification of individuals at risk provides a useful clinical and research framework for adverse proceedings and stratifying patients with CKD according to risk; conversely, precise complete risk prediction requires careful complex measures (Fischer et al., 2013).

Screening for disease in apparently healthy individuals in the expectation that early identification can lead to more successful intervention strategies is a very practical objective (Jaar et al., 2008). Therefore, this study screened apparently healthy individuals to make available absent data about CKD and its major associated risk factors, and to the best of our knowledge this is the first report from KSA in general and Hail region in particular,

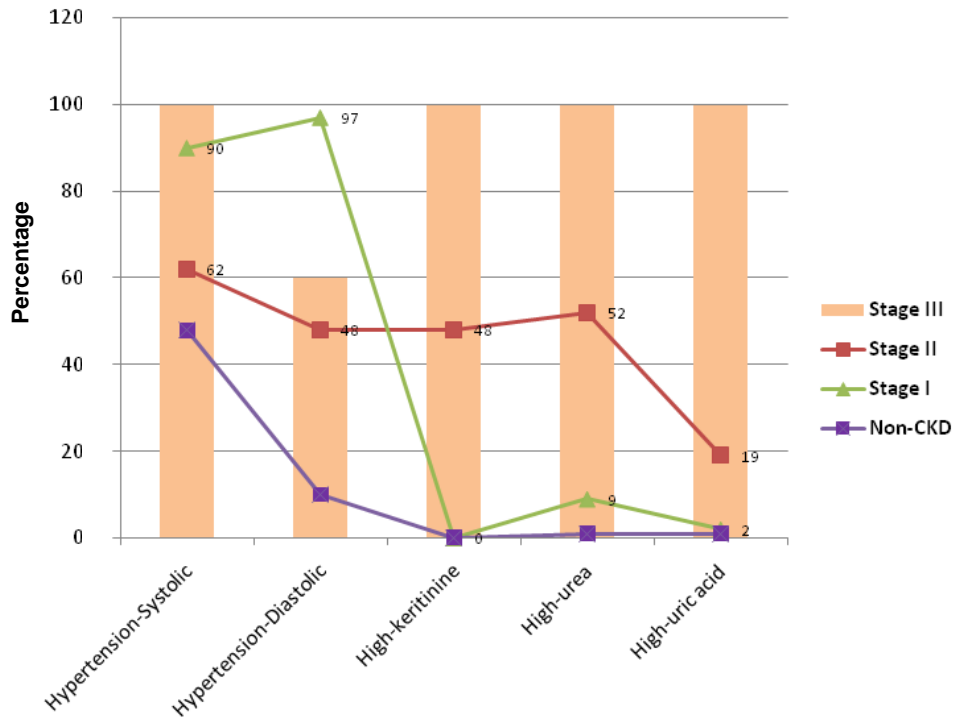


Figure 3. Description of blood pressure (BP), creatinine, urea and uric acid by the status of CKD within entire stage.

Table 1. Distribution of demographic characteristics by CKD.

Variable	Category	GFR<15	GFR=16-29	GFR=30-59	GFR=60+	Total	P value
		Stage III CKD	Stage II CKD	Stage I CKD	Non-CKD		
Frequency		5 (1.8%)	21 (7%)	44 (14.6%)	229 (76.6%)	299 (100%)	-
Gender	Male	3	9	15	78	105	0.379
	Female	2	12	29	151	194	
Age	<25 years	0	1	0	80	81	0.0001
	26-35	0	0	9	54	63	
	36-45	1	0	10	49	60	
	46-55	0	2	9	22	33	
	56-65	3	7	9	14	33	
	66+	1	11	7	10	29	
Education	Illiterate	3	19	24	52	98	0.0001
	Primary	1	2	10	59	72	
	Secondary	0	0	4	53	57	
	Higher	1	0	6	65	72	
Occupation	Employee	2	3	9	56	70	0.0001
	Housewife	2	9	21	54	86	0.0001
	Student	0	0	3	58	61	0.2
	Free-work	0	3	7	38	48	0.0001
	Others	1	6	4	23	34	0.0001

Table 2. Distribution of blood pressure (BP), creatinine, urea and uric acid by the stages of CKD.

Variable	Category	GFR<15	GFR=16-29	GFR=30-59	GFR=60+	Total	P value
		Sage III CKD	Sage II CKD	Sage I CKD	Non-CKD		
Frequency		5 (2.2%)	21 (9.1%)	44 (14.6%)	229 (76.6%)	299 (100%)	-
Systolic BP	Prehypertensive	2	4	20	34	60	0.008
	Hypertensive	3	9	20	19	51	
Diastolic PB	Prehypertensive	0	3	7	10	20	0.03
	Hypertensive	3	7	36	13	59	
Creatinine	High	5	10	0	0	15	0.04
	Normal	0	11	44	229	284	
Urea	High	5	11	4	3	23	0.06
	Normal	0	10	40	226	276	
Uric acid	High	5	4	1	2	12	0.321
	Normal	0	17	43	227	287	

that screened apparently healthy population for the presence of CKD and its related risk factors. Conversely, the intervention based on early detection can improve the long-term outcome of CKD.

However, the prevalence of CKD (24%) in the present studied population is very high as compared to reports from many other countries. In a report from Taiwan, the prevalence of an estimated GFR <60 ml/min/1.73 m² was 7% (Hsu et al., 2006). In another study, the overall prevalence of CKD in Norway was 10.2%, which is similar to that reported in the United States (Hallan et al., 2006).

Studies from Saudi Arabia and other Gulf countries, have only dealt with end stage renal disease (ESRD), as well as, the risk factors associated with CKD, such as, DM, hypertension, and other cardiovascular diseases. A recent review of 44 studies, have described the epidemiology of ESRD in the countries of the Gulf Cooperation Council (GCC; which consist of Saudi Arabia, the United Arab Emirates, Kuwait, Qatar, Bahrain, and Oman), showed that the incidence of ESRD has increased while the prevalence and mortality rate of ESRD in the GCC has not been reported sufficiently (Amal et al., 2012).

The modification of diet in renal disease study (Hunsicker et al., 1997) followed chronic kidney disease patients at all stages for a 2-year period and concluded that 85% of patients had a decline in their GFR, with the average rate of decline (4 ml/min) annually regardless of the baseline GFR. There are modifiable and non-modifiable factors that contribute to this decline. These factors have been shown to be significant regardless of the underlying etiology of the chronic kidney disease. In general, the non-modifiable risk factors associated with more rapid decline in kidney disease include increased

age, African-American race, and male sex. The modifiable risk factors are the focus of treatment to halt disease progression and include higher levels of proteinuria, a lower serum albumin level, higher blood pressure, poor glycemic control, and smoking (National Kidney Foundation, 2002).

Diabetes is the most prominent cause of CKD, accounting for 33% of adult CKD cases (National Kidney Foundation, 2002). Conversely, 20 to 40% of diabetics will develop diabetic nephropathy during the course of their disease (American Diabetic Association, 2008); therefore, as the number of diabetic patients increases, the incidence of CKD can be expected to follow.

In the current study, diabetes accounted for 26% of the study population and 46% of the cases of CKD. Meta-analysis of 6 GCC studies showed that the summarized estimate of diabetes prevalence is 47.85% (Shohaib et al., 1999; Shakuntala et al., 1992; El-Reshaid et al., 1994; Al Nasser et al., 1992; Kumar, 1997; Khan et al., 2002).

Vascular disease (primarily hypertension) is the second most common cause of CKD (it causes 21% of adult CKD cases) (Duaine et al., 2010). Hypertensive nephrosclerosis is associated with addition signs of hypertensive end-organ damage, because of long periods of poorly controlled hypertension. In the present study, the frequency of hypertension was high approximately 37% and the individuals with hypertension represent 44.3% of cases of CKD. The summarized estimate of hypertension prevalence among ESRD in GCC study was 77.88% (Amal et al., 2012).

Cardiovascular diseases including stroke, heart attack and CHF were identified in a reasonable number of cases of CKD. In 6 GCC studies, the summarized estimate of

cardiovascular disease prevalence is 14.51% (Khan et al., 2002; Al-Haddad et al., 2003; Al Wakeel et al., 2002; Alsuwaida et al., 2007; Hussein et al., 1994; Gabr et al., 2004; Al-Ali et al., 2008).

UTI and renal stones were also found in a number of CKD cases. The risk of UTI might be increased by CKD factors (e.g., papillary necrosis, nephrolithiasis, neurogenic bladder). There is evidence of increased risk for UTI in female patients with diabetes (Nicolle, 2005). Asymptomatic bacteriuria in women with diabetes is roughly three-fold greater than in women without diabetes, regardless of the degree of control of the hyperglycemia (Kunin, 1997). Several studies have found stone formers to be at increased risk for CKD and ESRD, but more research is needed. There may be significant heterogeneity in the risk for CKD, and better characterization of the stone types and clinical factors that identify stone formers at most risk for developing CKD are needed (Andrew et al., 2011).

The strengths of this study firstly, it presents adequate information based on epidemiological survey for multiple outcomes related to CKD. It provides evidence of the burden of CKD and defines the high-risk factors in the Hail regions. This information is extremely valuable for public health planners and administrators to allocate healthcare resources in Hail region, KSA, since most of such studies in KSA investigated the burden of potential risk factors for CKD.

LIMITATIONS

This study includes the cross sectional settings and the relatively small size, and we have argued earlier that a high percentage of older individuals, many of whom are females, will have a GFR less than 60 ml/min/1.73 m². Screening for CKD, based on GFR alone, will identify a largely older population (mostly female), many of whom will not have any corroborative evidence of “kidney disease.” Thus, it can be assumed that eGFR-based screening will generate a large number of “false positives,” using current criteria. Also, selected individuals with CKD should be followed up for at least 3 months, which we will do in the next phase. The frequency of CKD and its associated risk factors are very high in Hail region. Larger study population will be required to establish the role of these risk factors in the etiology of CKD in Hail region.

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Full Length Research Paper

Yellow fever outbreak in central part of Senegal 2002: Epidemiological findings

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In 2002, a yellow fever (YF) outbreak occurred in the regions of Diourbel and Fatick, centre of Senegal. The index case was a young woman without any history of vaccination. Immunoglobulin M (IgM) specific of YF was detected in her blood by the Centre de Référence OMS sur la Recherche des Arbovirus et des Fièvres Hémorragiques (CRORA) in the Institut Pasteur of Dakar. According to specific case definitions, both active (investigation) and passive detection (surveillance) of human cases were performed and completed by entomological surveys. From September to December 2002, a total of 35 individuals recently infected by YF were identified out of 379 blood samples collected. During the investigation in October, 23 confirmed cases of YF were detected, including 11 deaths. All entomological indexes (Breteau, Container, House) were above the threshold of epidemic risk and 2 YF virus strains were isolated from *Aedes furcifer* collected in a village where YF cases and death were reported. Mass vaccination campaigns were urgently organized in all districts with positive cases to protect the populations.

Key words: Yellow fever, outbreak, mass vaccination, Senegal, West Africa, arbovirolosis.

INTRODUCTION

Yellow Fever (YF) is an acute viral hemorrhagic disease. The term "yellow" refers to the jaundice that affects some patients, causing yellow eyes and skin. The disease is endemic in tropical areas of Africa and Latin America, with a combined population of more than 900 million people. It is caused by the yellow fever virus (YFV), an enveloped RNA virus, belonging to the Flaviviridae family and the *Flavivirus* genus (Monath, 2001). The YFV is transmitted by the bite of certain mosquitoes of the genus *Aedes* (*Aedes aegypti* and other species). The mosquito gets infected when it feeds on viraemic animals in forests, such as monkeys. After the extrinsic incubation period (1 to 2 weeks), the infected mosquito becomes infecting, that is, it is able to transmit the YFV to another primate, in

particular a human being travelling through the forest (Vainio and Cuttis, 1998). The epidemic risk increases when infected humans return to the villages, semi urban areas or towns. Domestic populations of *A. aegypti*, living in close contact with human, are able to transmit the YFV both quickly and widely (Monath et al., 2008; Mutebi and Barrett, 2002; Staples and Monath, 2008). The infection results in asymptomatic form (Monath et al., 2008) or a wide spectrum of symptoms, from mild disease to severe illness and death (WHO, 2008). WHO estimates that 200,000 cases of YF occur every year in the world, causing 30,000 deaths. The number of YF cases has increased over the past two decades due to declining population immunity to infection, deforestation, urbanization,

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population movements and climate change. There is no specific cure for YF. The symptomatic treatment aims at reducing the symptoms for the comfort or survival of the patient (haemorrhage, organ failure). Up to 50% of severely affected people will die from YF, if intensive care is not quickly available. Vaccination is the most efficient preventive measure against YF. The vaccine is safe, affordable and cost-effective. It provides lasting and, in all appearance, lifelong protective immunity within one week for 95% of inoculated people (Staples and Monath, 2008; WHO, 2008).

YF is endemic in Senegal. The first well-described YF outbreak occurred in St. Louis du Senegal, in 1778 (Mutebi and Barrett, 2002). And, since the early 1930's sero-surveys have confirmed that Senegal was included in the YF endemic area of Africa. The implementation of YF vaccination decreases the burden of the disease, but, until now, several confirmed cases are regularly reported, in the centre and the south of the country (Digoutte, 1999; Digoutte et al., 1981; Salaun et al., 1981; Strode et al., 1951). In 2001, an epidemiological and entomological investigation has been carried out in the region of Diourbel (centre of Senegal) after the identification of 3 YF cases. The epidemiological investigation has revealed that an epidemic of YF did occur in the district of Bambey at the end of 2001 (14 new cases have been identified during the investigations). The entomological surveys have shown that *A. aegypti*, principal vector of YF, was ubiquitous in the investigated area and that all indices for the immature population of the vector (Breteau, container, house) were above the threshold of epidemic risk. Within the vector populations, a real risk of reappearance, even amplification of the epidemic during the following year was stressed. Again, in 2002, a new case of YF was confirmed in "Hôpital Principal" of Dakar: young woman, referred by the health centre of Touba (region of Diourbel) and hospitalized on the 15th September. The patient did not receive any recent vaccination, so that the presence of specific YF IgM permitted to confirm the diagnosis. The case was declared at the ministry in charge of healthcare in Senegal and a collection of blood samples was organized on hospitalized patients in the four health centers and some primary health units of the region of Diourbel. A total of 11 new cases of YF were identified out of 112 samples. Therefore, a multidisciplinary investigation was requested by the Ministry of health. It aimed to evaluate the number of cases of YF in the whole region of Diourbel and the risks of epidemic spreading into the bordering regions, in order to setup appropriate control measures and limit the impact of the diseases.

MATERIALS AND METHODS

This study took place from 4 to 13 October 2002. The investigation concerned the whole region of Diourbel (health districts of Touba, Mbacke, Diourbel and Bambey) and the health district of Colobane in the region of Fatick. It has been associated with an active

research of cases in the district of Niakhar and the villages of Dielmo and Ndiop, in the region of Fatick.

Case definition

A suspected case was defined as any person (1) presenting with acute onset of fever associated with jaundice appearing within 14 days of the first symptoms and/or (2) associated with hemorrhages and/or (3) deceased in a context of fever without any other etiology, since 1 July 2002. A confirmed case was a subject carrier of IgM specific of YF in absence of documented vaccination.

Search for and surveillance of human cases

Suspected and confirmed cases have been identified through laboratory results, health structures registers and interviews of doctors or nurses managing the health structures. The objective of the interview was to determine if the healthcare staff have seen or hear about cases presenting feverish jaundice, hemorrhagic fever, "malaria resisting to the treatment" and/or suspicious deaths, since 1 July. For each suspected case, the address was researched and he was visited at home. An active research of new cases was conducted in the neighborhood with the co-operation of village leaders and rural agents and villagers. They were questioned about people meeting the criteria of suspected cases or deaths associated with jaundice in the last three months. All suspected cases, patients with non-febrile illness (headache, nausea and vomiting, myalgia or lumbosacral pain) and asymptomatic people were proposed an inclusion in the sero-epidemiological study. Symptomatic individuals were examined by the doctors of the mission. An investigation form was filled out for all included people as well as a blood sample, to confirm or not the infection.

Serologic and entomologic investigations

With the agreement of the concerned people or their relatives, a questionnaire has been given to the suspicious cases and/or to a part of their close neighboring. Venous blood samples were obtained from these patients and randomly from healthy close neighboring persons in villages where probable or confirmed cases were observed. Sample collected in the field were stored and transported in liquid nitrogen to the Institut Pasteur of Dakar. Human blood samples collected were systematically tested for anti-YFV, dengue 2, Chikungunya fever, Rift Valley fever, Crimean-Congo and West Nile viruses IgM as previously described (Faye et al., 2007).

Tests for the presence of IgM specific to YF using Elisa and virus isolation on acute phase sera were performed in parallel with intracerebral inoculation of suckling mice and by inoculation on AP61 mosquito cell line.

An entomologic survey was conducted. Adult mosquitoes were collected at the evening from 18:00 to 21:00 pm after landing on immunized human volunteers. They were sorted and pooled by species and sex in the field and stored in liquid nitrogen. *Aedes* larval development sites were investigated in all localities indoor and outdoor of households randomly selected as well as in the peri-domestic areas. In the selected household, all containers holding both potable and non-potable water were inspected with a flashlight when necessary. For infested container, larvae or pupae were collected and taken to the laboratory (insectary) for rearing. The emerging adults were identified on a chill table and using a morphological keys (Edwards, 1941; Rueda, 2004).

The Breteau index (number of containers with larvae or pupae of *A. Aegypti* per 100 houses), container index (number of containers with larvae pupae of *A. Aegypti* per 100 water filled containers) and

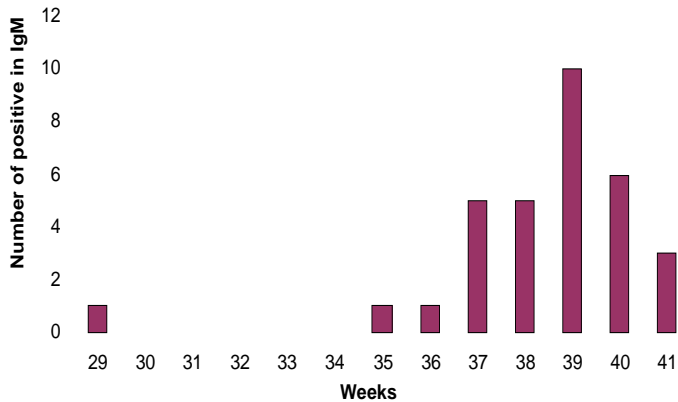


Figure 1. The epidemic plot includes the index case, the 11 detected cases before the investigation and the 23 cases identified during the investigation. For 3 individuals, the starting date of the symptoms is unknown. For the 32 other cases, the starting dates of the symptoms are spaced between 15 July 2002 and 9 October 2002 (weeks 29 to 41).

house index (number of positive houses per 100 by the houses) were calculated (WHO, 1986). The adult aggressiveness was expressed as the number of mosquito bite per person per evening.

The prospects have been done in the localities where cases of YF have been suspected and/or confirmed. In all, 6 villages of the Departments of Gossas (region of Kaolack), Bambey (region of Diourbel) as well as 7 districts of the towns of Touba and Mbacke (Department of Mbacke, region of Diourbel) have been visited.

RESULTS

Investigation of index case identified at principal hospital of Dakar

Aged 18 and residing in Touba (region of Diourbel), the young woman has started to present a febrile syndrome at the end of August with a *falciparum* malaria diagnosis. Her clinical signs worsened on 13 September with the appearance of jaundice and hemorrhagic syndrome (epitaxis and gingivorrhagies). She has then been hospitalized at the health centre of Touba. At the appearance of neurologic troubles (obsession), two days later, she has been addressed to Principal Hospital of Dakar (PHD), with a suspicion of YF among other hemorrhagic fevers. When she arrived at the PHD intensive care unit, she was presenting a febrile coma, a clear jaundice, an hematury, some vomito-negro, an anemic syndrome and a multi visceral failure. A blood sample has been addressed to Dakar Institute Pasteur at the Centre de Référence OMS sur la Recherche des Arbovirus et des Fièvres Hémorragiques (CRORA) which has shown IgM specific of YF. The patient recovered progressively.

That patient said she had not moved out of the district of Touba the month preceding her symptoms. However, her family is from Ndeme (district of Bambey, region of Diourbel), a village where the majority of YF cases had

been identified in 2001. Relatives living in this village have visited her a short time before her sickness. Moreover, two other people living with her have been ill at the same period.

Results of the mission of investigation in the field

The region of Diourbel involves 73 health structures with hospitals, health centers and primary health posts (19 for the health district of Diourbel, 21 for Bambey, 16 for Mbacke and 17 for Touba). The interviews with the medical personnel could take place in 70 health structures and registers could be consulted in 65. In all the 66,817, reports could be examined in the registers of the months of July, August, September and October.

Two hundred sixty six (266) blood samples were collected from individuals in villages where cases were detected. Twenty three individuals with specific IgM antibodies were considered to have had a recent YF virus infection. The epidemic plot includes the index case, the 11 detected cases before the investigation and the 23 cases identified during the investigation e.g., annex (Figure 1). For 3 individuals, the starting date of the symptoms is unknown. For the 32 other cases, the starting dates of the symptoms are spaced between 15 July 2002 and 9 October 2002 (week 29 to week 41). Among the 266 people included in the investigation and for which a blood sample could be obtained, the proportion of confirmed YF cases was identical according to gender (male: 12/130 versus female: 11/130). The cases were aged 3 to 38 and no case has been detected among the 54 people (aged 40 and more).

Entomological results

Table 1 shows the dominant species in the epidemic area and all potential vector of YF. A total of 654 adult mosquitoes belonging to 3 genera and 8 species were collected in the affected area. *Culex quinquefasciatus* (68.06%), *A. aegypti* (18.19%) and *Aedes furcifer* (12.07%) were the common species and constitute 98.3% of the fauna. Globally, *C. quinquefasciatus* was the most aggressive with density fluctuating between 0.42 bite per person per evening in Belel Doki up to 8.31 bite per person per evening in Darou Minam. Concerning *A. aegypti*, the most important aggressivities were recorded in the villages belonging to Bambey Departments like Ndione (2 bites per person per evening), Nguel (4.38 bites per person per evening), Ngascope (2.5 bites per person per evening). *A. furcifer* was much localised in the villages belonging to Gossas Departments where people received up to 2.83 bites evening in Belel Doki.

A total of 2 YFV strains were isolated from *A. furcifer* collected in Belel Doki. The minimum infection rate was 2.94% whereas the inoculation rate was 0.83 infected

Table 1. Adult mosquitoes collected in each community in the affected region, October 10 to 16th 2002.

Species	Number of mosquitoes collected (Number of specimen collection per person per evening)											Total
	Darou Miname	Darou Nahim	Darou Marnane	Foudaye	Ndione	Ngascope	Nguel	Refane	Mbacké	Colobane	Belel Doki	
<i>A. aegypti</i>	6 (0.38)	21 (1.31)	4 (0.25)	13 (0.81)	16 (2)	20 (2.50)	35 (4.38)	2 (0.25)	1 (0.13)	0	1 (0.04)	119 (0.53)
<i>A. furcifer</i>	0	0	0	0	0	1 (0.13)	1 (0.13)	0	0	9 (0.38)	68** (2.83)	79 (0.35)
<i>A. vittatus</i>	0	0	0	0	0	0	0	0	1 (0.13)	0	0	1 (<0.01)
<i>C. quinquefasciatus</i>	133 (8.31)	46 (2.88)	130 (8.13)	115 (7.19)	0	3 (0.38)	0	8 (1)	0	0	10 (0.42)	445 (1.99)
Others	1	1	1	1	4	0	0	0	0	0	2	10
Total	140	68	135	129	20	24	36	10	2	9	81	654

A. dalzieli. *A. gambiae*. *C. antennatus*. *C. tritaeniorhynchus*. **2 Yellow fever virus strains isolated.

Table 2. Aquatic stages investigation and YF epidemic risk indexes for each community in the affected region, October 10 to 16th 2002.

Department	Community	No. of houses	HU	No. of positive containers/No. of containers inspected						Total	BI	CI	
				Clay Jar		Barrel		Other**					
				Indoor	Outdoor	Indoor	Outdoor	Indoor	Outdoor				
Mbacké	Touba	Darou Nahime	20	44	0/1	0	0/1	0/1	0	16/27	16/30	36.4	53.3
		Darou Miname	22	94	0/1	6/9	1/1	0/1	0	6/8	13/20	13.8	65
		Ndamatou	20	112	1/2	4/5	0	1/1	0	17/21	23/29	20.5	79.3
		Madyana	20	114	0/2	1/3	0/1	1/1	0	16/19	18/26	15.8	69.2
		Keur Niang	20	93	0/1	3/10	0	1/2	0	8/18	12/31	12.9	38.7
		Forage Baye lat	21	100	0	5/9	1/1	4/6	0/1	13/15	23/32	23	71.9
Bambeye	Ngoye	Ndione	23	107	5/8	67/98	0	9/14	0	4/5	85/125	79.4	68
		Ngascope	20	82	3/3	47/66	0	2/6	0	0/2	52/77	63.4	67.5
		Nguel	8	59	1/1	30/39	0	4/7	0	2/3	37/50	62.7	74
		Refane	15	82	0/1	10/22	0/1	21/36	0/0	2/3	33/63	40.2	38.8
		Foudaye	15	51	0	12/19	0/1	14/24	0	0/2	26/46	50.9	56.5
		TOTAL	204	938	10/20	185/280	2/6	57/99	0/1	84/123	338/529	36	63.9

** Other includes tanks, chicken watering containers, discarded containers, tires, pots, bucket.

bite per evening meaning that *A. furcifer*, was responsible for at least 1.2 infected bites per person every fortnight.

Table 2 exhibits the results obtained in the 12

communities of the 3 department visited. In total, 650 containers mostly use for water storages were inspected in 204 houses corresponding to 938 habitation units. The main larval habitats

found in localities prospected were clay jars, plastic or metallic barrels and tanks.

The Breteau and container indices were variable according to the communities. The Breteau

indices ranged from a minimum of 13.8 in Darou Minane to a maximum of 79.4 in Ndione while the container indices ranged from 38.70 (Keur Niang) to 79.33 in Ndamatou. Except for Belel Doki, these indices indicate a high risk for yellow fever transmission in all communities.

The strong presence of *C. quinquefasciatus* and *A. Aegypti* in the localities of Bambey and Touba (despite pulverizing of insecticides) has also noted. However, in Belel Doki a village belonging to the Department of Gossas and where confirmed cases, among which a death, have been recorded, only wild vectors (*A. furcifer*) has been collected. Further two YFV strains were isolated from *A. furcifer* collected in this village.

DISCUSSION

YF is endemic in Senegal. Since 1950, several confirmed cases are regularly reported, in the Center and the South (Salaun et al., 1981). Clinical and serological arguments show that the outbreak that has affected the district of Bambey region of Diourbel in 2001 has been spread out in all the region of Diourbel and in the bordering regions in 2002. Previous studies had shown a high prevalence of IgG antibodies in human and simian populations which clearly indicated that increased sylvatic YF activity in Eastern Senegal has increased the risk of YF transmission among rural populations in Senegal.

Among the potential vectors of YFV, *A. aegypti*, *A. furcifer* and *Aedes vittatus* were recorded. *A. aegypti* is known as the main vector of urban epidemics of YF in Africa and South America. Its presence in the area of interest is already known and its involvement in YF epidemic transmission has already been described during previous epidemics (Chambon et al., 1967; Fontenille et al., 1997; Thonnon et al., 1999).

A. furcifer is known as a sylvatic vector but with its large flight range. It may contribute to both sylvatic transmission and virus dissemination from the forest zone to human habitats where the species is some time very abundant. The species play an important role in the transmission of YFV mainly during epidemic affecting rural area in Africa (Germain et al., 1980; Port and Wilkes, 1979). Concerning *A. vittatus*, the species is a proven experimental vector of yellow fever found associated with yellow fever virus in nature.

However, it is still considered a secondary vector since very little information has been obtained about its involvement during epidemics of yellow fever. The species was only incriminated as responsible of the YF epidemic that occurred in Sudan in 1940 (Kirk, 1941) and suspected as the main vector during the YF epidemic that occurred in Jos plateau in Nigeria in 1959 and 1969 (Lee and Moore, 1972).

The high densities of *C. quinquefasciatus* reflect the known anthropophilic behaviour of the species, associated to the human habitation in houses where collections of polluted water are frequent (latrines, wastewater

discharge channels). Although abundant, there is no risk related to this species since its involvement in the transmission cycle of YF virus has never been demonstrated.

It is possible that other YFV vectors exist in the area prospected. The short time dedicated to the study, the unfavourable environmental conditions coinciding to the end of the rainy season, related to the population dynamic of mosquito vectors may affect our list of species recorded as well as their representation.

Considering the species recorded in the affected area, we could conclude about an intermediate epidemic transmission involving *A. aegypti* and sylvatic vectors. This transmission cycle is the most common in the west African (Germain et al., 1980) and is the only one described to date in Senegal (Thonnon et al., 1999).

However, the distribution of the vector, indicate different transmission profile with the sylvatic vector *A. furcifer* displaying the main role in the zone of Gossas (Bele Doki land Colobane), while *A. aegypti* exhibit a major role in the department of Mbacke (Touba) and Bambey.

Conclusion

A. Aegypti, the epidemic vector of YF, has been present everywhere, in all the villages and towns prospected among which the town of Touba (main urban and commercial trade area of the region) and the index (Breteau as container), has been everywhere largely over the limit of the epidemic risk defined by WHO.

Taking into account the particularly important movement of travelers between the region of Diourbel and the rest of Senegal for commercial activities purpose, the health services in all the regions of Senegal have been alerted and have reinforced their surveillance system. Vaccination of all the population of Diourbel has been organized and spread out to the districts of Fatick where cases have been suspected. The surveillance setup has been permitted to collect 888 other samples and identify 36 new cases of some of these cases, which came from other regions than those previously infected: Dakar, Thies, Louga, Tambacounda and Kolda which indicated that the outbreak was more spread out than initially located.

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Full Length Research Paper

The promise of the services sector sustainability: A United Arab Emirates (UAE) perspective

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Emirates value their health care system above any other social program. The system of health care in the United Arab Emirates (UAE) faces significant financial and population pressures, relating to comprehensiveness, universality, accessibility and portability, healthcare quality, healthcare cost, and communication technologies (ICTs). All of these challenges are significant catalysts in the development of technologies that aim to significantly mitigate or eliminate these selfsame challenges. The privatization of many governmental hospitals by foreign specialized institutions in the UAE may play an increasingly significant role in these initiatives, as the management of health information becomes a more crucial factor in the successful delivery of health care services in the new millennium. The new corporate body 'John Hopkins Health System' is developing a pan-UAE electronic health solution. The Ministry of Health (MOH) and privatization initiatives will play an increasingly significant role in these initiatives, as the management of health information becomes a more crucial factor in the successful delivery of health care services in the present time. The MOH will play an increasingly significant role in these initiatives, as the management of health information becomes more crucial. UAE is actively developing and implementing technological solutions to deliver health information and health care services across the country. The major objectives of this paper was to analyze the changing social contexts and factors influencing the transformation from a real community to a virtual community by the adoption of e-health, and to propose actions needed to create an enabling environment for e-health services growth and utilization in the UAE.

Key words: e-Health, healthcare, communication technologies (ICT), John Hopkins System, United Arab Emirates (UAE).

INTRODUCTION

The term e-health is used in line with other "e-words" such as e-commerce, e-business, e-solutions, etc., in an attempt to convey the promises, principles, excitement around e-commerce (electronic commerce) to the health arena, and to give an account of the new possibilities the

Internet is opening up to the area of health care. Intel, for example, referred to e-health as "a concerted effort undertaken by leaders in health care and hi-tech industries to fully harness the benefits available through convergence of the Internet and health care (Mieczkowska

et al., 2004).

The term may be define as follows: e-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology (Eysenbach, 2001). These processes exhibit dead ends, feedback loops, multi-directional interactions, parallel developmental paths, and unintended consequences (Hendy et al., 2005).

The national communication technologies (ICT) plan includes a long-term vision. The long-term vision is "to transform the country to an information society, so as to increase effectiveness and efficiency, and provide e-services for all sectors of the society, and build a solid ICT industry to become a major source of income for the nation". The objectives seek to bridge the digital divide by enabling all societal sectors to reach and access ICT services easily and utilize them effectively. Other objectives include creating job opportunities, raising the efficiency of education and training through ICT plus the preparation of qualified manpower (Amir et al., 2009).

A global network would allow organizations in the health industry in the United Arab Emirates (UAE) to increase existing knowledge, and thus total productivity, while also supporting an environment where the generation of new ideas is unrestricted. The authority of e-health tools in the UAE may benefit from the development of a European service industry in the health sector, which has enabled them to build a strong base from which they can tackle this issue efficiently.

E-health is breaking down barriers, enabling health service providers (public authorities, hospitals) to work more closely together. The introduction of e-health services is facilitating access to healthcare, whatever the geographical location.

Probably, the most serious negative impact of the introduction of technological innovations in the health sector is the focus of attention on technology without proper assessment of its effectiveness and its role and impact in the relationship between patient, communities, and care providers (Benjamin et al., 2010).

In knowledge based economy, e-health care will create greater opportunities for citizens to access learning on line, and for knowledge providers to make knowledge content available (courses, seminars, conferences). The government plan in the UAE includes projects that cover the main aspects of ICT usage such as e-Government, e-Commerce, tele-work, and telemedicine, and e-learning. Further, they cover the regulatory activities such as issuing licenses for new voice and data operators, and regulating the ICT market (Williams et al., 2003).

This study highlights some of the expecting developments that will occur in the health sector in the UAE due to internet usage like e-health, and computer supported social networks. This research is an overview of the healthcare services in the UAE. It further suggests how the remote areas healthcare service delivery could be improved through the use of ICT.

THE STATE OF EMIRATES PROFILE

The UAE is a federation of seven states formed in 1971. Since then, it has grown to one of the Middle East's most important economic centers. In 2009, the UAE was estimated at 6 million and area of 77,700 km². Although each emirate maintains a large degree of independence; the UAE is governed by a supreme council of rulers made up of the seven emirs, who appoint the prime minister and the cabinet. The capital of UAE is Abu Dhabi. The largest emirate, Abu Dhabi, accounts for 87% of the UAE's total area (67,340 km²). The 15 to 65 age groups have a male/female sex ratio of 2.743. The UAE's gender imbalance is only surpassed by other Arab countries in the Persian Gulf region. The most populated city is Dubai, with approximately 1.6 million people. Other major cities include Abu Dhabi, Al-Ain, Sharjah, and Fujairah. About 88% of the population of the UAE is urban. The remaining inhabitants live in tiny towns scattered throughout the country or in one of the many desert oilfield camps in the nation. The average life expectancy is 75 years, higher than any other Arab country (UN, 2009).

THE JOHNS HOPKINS HOSPITAL AND HEALTH SYSTEM

Johns Hopkins Health Care LLC (JHHC), jointly owned by the Johns Hopkins Health System and the Johns Hopkins University School of Medicine, develops contracts and administers services and support for three health plans: Priority Partners Managed Care Organization, Johns Hopkins Employer Health Programs (EHP) and Johns Hopkins US Family Health Plan (USFHP), and have been servicing Maryland since 1983.

For more than a century, Johns Hopkins has been recognized as a leader in patient care, medical research and teaching. Today, Johns Hopkins Medicine is known for its excellent faculty, nurses and staff specializing in every aspect of medical care. The Johns Hopkins Health System includes three acute-care hospitals and programs for local, national and international patient activities (Wikipedia, 2010).

Johns Hopkins Medicine International brings world-class health care to more than 25 strategic projects in Europe, Asia, the Middle East and Latin America. They are working now in the UAE in the health sector supervising

and managing some hospitals in the emirates.

E-HEALTH CHALLENGES

The promise of e-health lies in the manner and degree to which it can mitigate or resolve these challenges to the health system and build on advancements in ICTs supporting the development of a health infrastructure. These solutions, while exciting and promising, also present new challenges, particularly in regard to acceptable standards, choice of technologies, overcoming traditional jurisdictional boundaries, up-front investment, and privacy and confidentiality. The healthcare sector in the remote areas of the UAE has the following challenges:

- a) Comprehensiveness (provision of medically necessary services),
- b) Universality (availability to all citizens),
- c) Accessibility and portability (entitlement to coverage across provincial/territorial lines
- d) Healthcare quality,
- e) Healthcare cost, and
- f) Communication technologies (ICTs)

Despite the increasing global interest in information technology among health care institutions, little has been discussed about its importance for the effectiveness of knowledge management for the UAE. The UAE faces a number of challenges in the development of effective e-health solutions. The health care institutions would benefit from developing global problem-solving collaboration, which allows practitioners to exchange knowledge unrestricted by time and geographical barriers (Tobias, and Peter, 2009).

The new thinking and new platform accepts that reality as a fundamental fact of life, and creates an on-line virtual community environment (the e-knowledge), where people will have a greater ability, reason, and incentive to want to share, trade, and exchange knowledge (Tan et al., 2006). The political structure of funding of health services in the emirates is a unique factor and a matter currently of intense scrutiny and considerable differences. The division of both initiatives, managerial and fiscal accountability across the emirates and the government lines has created tensions particularly around the question of the current level, and most appropriate future level of funding. The data protection of health records against intrusion, unauthorized use, data corruption, intentional or unintentional damage, theft, and fraud is a universal concern and a high priority issue in most countries. Given the sensitive nature of healthcare information and the high degree of dependence on trustworthy records, issues of reliability, security, and privacy are of particular significance. There is, however, ambivalence about privacy, because of the potential benefits of community

access to personal information (Connell and Young, 2007). Unfortunately, since regulation and legislation often lag behind technology, privacy is generally addressed in reactive rather than proactive mode. The health sector has not taken advantage of the range of ICT opportunities as effectively as other social sectors, and has been conspicuously underrepresented in national technology development policies and plans. Public health authorities invariably declare the criticality of information for decision-making and informed action, but repeatedly fail to follow up with commitment, resources, and sustainable engagement.

The lack of involvement of public sector stakeholders in the use of ICT gives cause for concern. There is a clear danger that by failing to adopt ICT solutions the public sector may become incapable of competing with the private operators, and may hasten the reduction and even the demise of public services. In this respect, competition among private firms that develop downstream, innovative, proprietary technologies relying upon basic ICT standards should be fostered (Kaplan, 2001).

Policy development is often a long evolutionary process. Developing countries may require direct assistance in the definition of policies and strategies as well as with the establishment of the appropriate regulatory environment (Safran et al., 1998).

Lack of information about projects, methodologies, technical solutions and their impact is a major problem. Demonstrating effectiveness of new technologies is especially challenging, since well- designed and randomized controlled trials are not feasible. There have been only sporadic attempts to collect project information through limited surveys or case studies. The World Health Organization recently established a Global Observatory for e-health (for example in Latin America and the Caribbean - OSILAC), but nothing about the UAE or the Gulf region.

Geography has a significant place in the current critique and future development of the health system. The population of the UAE has a skewed sex distribution consisting of more than twice as many males as females. The UAE is a country of only 6 million people spread unevenly across 77,700 km² of the earth's surface it shares a 530-km border with Saudi Arabia on the west, south, and southeast, and a 450-km border with Oman on the southeast and northeast. While the majority is concentrated in a few urban areas, a significant proportion is scattered across the landscape in hundreds of geographically isolated communities, many in areas of extreme climatic conditions. The climate of the UAE generally is hot and dry. The hottest months are July and August, when average maximum temperatures reach above 48°C (118.4°F) on the coastal plain. These factors pose serious challenges to the provision of equitable, accessible, and high quality care (UN, 2009).

There are important reasons for government regulators to be actively engaged in issues such as the management

of private patient information including the setting of minimum criteria for privacy of healthcare records in order to cultivate patient trust. Nevertheless, the ICT private sectors who are the domain specialists in this arena must be allowed to work together to jointly develop standards within private standards-setting organizations (Wootton et al., 2007).

The quality of healthcare in the remote and urban areas also differs. While the urban localities have healthcare options from five star medical colleges to small private dispensaries run by trained doctors, the remote areas often are left with the only option of untrained well private practitioners. The UAE is divided into seven emirates, with Abu Dhabi the largest of all seven emirates with an area of 67,340 km², equivalent to 86.7% of the country's total area, excluding the islands. The division of political, managerial and fiscal accountability across provincial and federal lines may raise the question of the current level, and most appropriate future level of funding, and work efficiency (UN, 2009).

The demographic and human resource picture illustrates other challenges to health care. The 15 to 65 age groups have a male/female sex ratio of 2.743. Seniors constitute one of the fastest growing groups in UAE society. The average life expectancy is 75 years, higher than any other Arab country. This growing portion of the population will inevitably require, it is assumed, the devotion of a larger proportion of expensive health resources (UN, 2009).

The UAE is a country of cultural diversity, which has created some unique health challenges. The country's net migration rate stands at 22.98, the world's highest. 23% of the populations are non-Emirates Arabs and Persians and the majority of the population, about 50%, is from South Asia and fewer than 20% were UAE nationals or emirates. Approximately, 1.75 million Indian nationals reside in the UAE, making them the single largest expatriate community in the country. Other major groups include 1.25 million Pakistanis, and 600,000 Bangladeshis. Those from other parts of Asia (including the Philippines, Iran or Sri Lanka) comprised up to 1 million people. The rest of the population was from other Arab states. Thousands of Palestinians, who came as either political refugees or temporary employment, also live in the United Arab Emirates. There is also a sizable population of people from Egypt, Somalia and Sudan who migrated to the UAE before its formation. The UAE has also attracted a small number of expatriates from developed countries in Europe, North America, Asia, and Oceania. More than 100,000 British nationals live in the country. Such diversification directly impacts government planning, fiscal considerations and distribution of services (which may overlap in kind, but differ in language) (UN, 2009).

Standards of healthcare are considered to be generally high in the UAE, resulting from increased government spending during strong economic years. According to the

UAE government, total expenditures on healthcare from 1996 to 2003 were US\$436 million. According to the World Health Organization, in 2006 total expenditures on health care constituted 2.6% of gross domestic product (GDP), and the per capita expenditure for health care was US\$673. General government expenditure on health as percentage of total government expenditure is 8.7% and health care currently is free only for UAE citizens. Arguments abound about it being less or more than it was or should be, and whether it must increase or decrease. Is the growth sustainable? Are the private/public and federal/provincial funding proportions appropriate? There are many questions being considered. Alternative funding and management models are being actively explored and implemented at all levels of government (UN, 2009).

According to World Health Organization statistics, the UAE is ranked forty-fourth in the world in terms of health care (Lubitz and Wickramasinghe, 2006). But the history of the health sector privatization, UAE geography, political structure, demography and finances are exerting pressures for change on the delivery of health care. In this context, advancements in ICTs, and the subsequent interest in e-health holds much promise in mitigating if not eliminating, a number of the challenges faced by our current and much valued health-care system (UN, 2009).

STRATEGIC DIRECTIONS AND PROMISE OF E-HEALTH

A Hospital Management Information System (HMIS) is currently being implemented in some hospitals and clinics across the country. Telemedicine has been used with great success in "Twam Hospital" (in Al-Ain/Abu Dhabi Emirates) managed by John Hopkins Institution, as well as a cluster of military hospitals. Other hospitals are connected for voice and video conferencing services as well as remote diagnostics. The system links UAE hospitals to medical facilities abroad for lectures and video consultations as well as live casting of operations. Ministry of Health (MOH) has also embarked on a program to link additional hospitals in major cities and important rural areas in its efforts to further telemedicine services and infrastructure as well as provide international connectivity to these sites.

The health authority in the UAE initiatives is replacing fragmented and poorly organized implementation of information and communication technologies in the healthcare sector by consistent, rational and coordinated activities and technical solutions in order to enable electronic exchange of medical data. The government national e-health system efforts scope contained the design and development of a national e-health system core and implementation of the pilot version of the system. The e-health system, when developed, has to secure the following functionality and comply with following main

requirements:

- (1) Information exchange between the systems performing e-health functions and between the participants of the e-health system (e.g. health care institutions);
- (2) Nationwide functionality of accessibility to registries;
- (3) Implementation of the following unified principles and procedures for full functionality of the e-health system: access to private, medical, administrative and other system information;
- (4) Nationwide identification of patients, health care specialists and administrative staff; and system interfaces and internal information exchange and information exchange with external objects; and
- (5) Support of the development, implementation and usage of the standards and regulations relevant to e-health system (Loane, and Wootton, 2002).

This is a challenging time for the public health in the UAE, and particularly for the fragile health of populations in developing countries. However, the increasing resources for international health aid and growing demand to improve health systems offer an opportunity to foster health equity in countries most in need. The mission of WHO Knowledge Management (KM) is to help bridge the “Know-do gap” in global health by fostering an environment that encourages the creation, sharing, and effective application of knowledge to improve health. Information and communication technologies offer great potential to improve health services and systems. As well as incorporating ICT in its technical work, WHO is supporting country health systems through advocating evidence based policies, monitoring e-health trends, identifying good practice, facilitating networks of expertise, and promoting norms, standards, and the integration of ICT into health workforce training and practice (WHO, 2006).

The provinces and territories plan, finance and manage the provision of hospital care, physician and allied health care services, some drug costs and public health. The main objective of privatizing the health sector in the UAE is to improve the quality of healthcare services’ delivery by implementing a national e-health system. The system would: provide access to commonly used, structural and standardized healthcare information; improve the coordination of healthcare delivery at different levels in order to ensure the continuity of health care; collect and evaluate information required for the implementation of the health system reform, management and planning purposes; and ensure access for doctors to the latest information and medical evidence (Gaynor et al., 2009).

Given the sensitive nature of healthcare information and the high degree of dependence on trustworthy records, issues of reliability, security, and privacy are of particular significance. Policy development is often a long evolutionary process. Developing countries may require direct assistance in the definition of policies and

strategies as well as with the establishment of the appropriate regulatory environment.

Resistance to change has become rooted in certain professional roles; the introduction of ICT in healthcare disrupts traditional structures and hierarchies. Frequently, professionals are unwilling to collaborate in recording and exchanging patient data, with concomitant distrust for off-site data storage and access control (Christopher and Craig, 2009).

There is a clear danger that by failing to adopt ICT solutions the public sector may become incapable of competing with the private operators, and may hasten the reduction and even the demise of public services (Tuan, 2008).

The John Hopkins co-operation and multilateral agencies must join national and international authorities to call for the financing of long-term projects by multilateral institutions. Consistent with these objectives, these agencies should promote and support technical co-operation between the different areas in the UAE, and foster the use of appropriate technology and knowledge assets.

Of all the services that government engages itself in public healthcare is the most sensitive domain as its quality and access has always been a major concern. The main reason for such a concern is that in case of public healthcare delivery, if right information is not delivered to the right people at the right place and at the right time, many lives would be lost (Ghani et al., 2008).

CHALLENGES IN THE HEALTH SECTOR

The UAE health sector has positioned itself to address challenges to both the health-system in general and to the development and implementation of e-health solutions. A number of initiatives have sprung up in the last decade to meet the challenges of geographic isolation, climate extremes, shifting population demographics, political dynamics, cultural differences, financial considerations, limitations imposed by technologies, lack of standards, low levels of automation in clinical settings and privacy and confidentiality.

Many practical issues will arise as global e-health becomes a reality, but of these the most critical may be policy. Policy determines the rate and direction of development of healthcare initiatives, yet the vast majority of the world’s countries have no legislation, e-health policy, or even guidelines. Therefore, the following may be cited as some of the goals for e-health tools to tackle healthcare:

- 1) Identification of gaps between the healthcare delivery setups and the vulnerable population with the help of information superhighways (Weerasinghe et al., 2007).
- 2) Availability of information systems which nurture knowledge (Scott et al., 2004).

The promise of intergovernmental cooperation and partnership is being realized across all of the provinces and territories. Widespread implementation of e-health will enable more "patient-friendly" healthcare services to be developed. The general orientation then was that the ongoing information and technology revolution (including cellular phones and the Internet boom) will introduce greater fluidity, allowing virtual teams to come together and disband as needed (Ginter et al., 1998).

Governments and large national agencies are not the only driving forces in e-health. Private companies, hospitals and health-care provider associations are actively and creatively involved in e-health initiatives. Numerous private companies have developed and are promoting the development of electronic health records, systems for health care transaction and business-to-business e-commerce, and clinical automation systems in networks of clinics, private doctor's offices and local hospitals and specialists.

The required systems and architecture may lead to the restructuring of health systems organization and support greater external linkages, including strategic alliances or other partnering activities. In May 2005, the 58th World Health Assembly adopted a resolution on e-health calling on all the 192 WHO Member States to leverage the use of e-health in the pursuit of health-for-all vision. The actors involved in the implementation of e-health are healthcare organizations, physicians, policy makers, health management personnel, clinicians, paramedical personnel, pharmacists, application developers and citizens (WHO, 2007). These e-health tools further use existing ICT applications such as Internet, email and video conferencing services as a backbone infrastructure to reach to the healthcare requiring public (WHO, 2005).

The ideal is that in the future, emirates patients will be able to go to any member state and not sense any difference in the quality of health care they receive. Doctors and health bodies will be able to access information on residence patients just as easily as they do for local ones, and patient records will be accessible at any time from anywhere not only for professionals with the necessary access right but also for the patients themselves. Healthcare providers can better address increasing demand for healthcare, and cover the costs of new, advanced treatments. E-health services promise to raise the quality of care in remoter and rural areas, thanks to modern communications infrastructure (Ilioudi and Lazakidou, 2007).

Challenges concerning standards, technologies and product choices are being considered at a number of levels. The MOH lead UAE's participation in the International Organization for Standardization's Technical Committee on Health Informatics (ISO TC215). Through this committee, UAE is active in the development of national and international standards for data encryption, country identifiers, data models and other matters that are the technical bedrock on which e-health initiatives are

based.

The government of the UAE and large national agencies are not the only driving forces in e-health. Private companies, hospitals and nursing schools are actively and creatively involved in e-health initiatives. Numerous private companies in the UAE have developed and are promoting the development of electronic health records, systems for health care transaction, and clinical automation systems in networks of clinics, private hospitals and local hospitals and specialists. Large hospital facilities and multi-site hospital corporations are developing mechanisms to share data, records and other information within and between sites and departments. Patients have responded positively to many of the new technologies and their application.

Internationally, a number of policies and strategies are available to support UAE's development towards realizing sustainable e-health usage. Governments as policy-making organizations play a pivotal role in formulating regulations in the health sector. The contribution of the government is particularly important in developing countries, where the public health system is usually the major provider of services. Government policies often have a significant impact on governing, financing and regulating the health sector in developing countries.

The health authority in the UAE has already alluded to the recent resolution of the World Health Assembly and the health-for-all policy for the 21st century that underscores the potential role of ICT in health. The regional development and political forums such as the "Arab Health Ministries Board (AHMB)", sub-regional economic communities, regional development banks and the United Nations Economic have elements in their policies and/or strategies encompassing ICT development (Mohsin, 2004).

Researchers found that majority of doctors agree that ICT improves the quality of healthcare services that they provide. Doctors not using ICT, cite a lack of training and technical support as major barriers. To spread e-health, they ask for more ICT in medical education, more training and better electronic networking among healthcare practitioners wanting to share clinical information. ICT is concerned with the storage, retrieval, manipulation, transmission or receipt of digital data (Wickramasinghe et al., 2007). ICT could be also used in facilitating a continuing medical education to the practitioners in the rural localities. They are an important part of the 'rural healthcare system'. However, the practices need to be standardized through adequate trainings and regulation (Berlinguer, 1999).

While public healthcare system in UAE has the best professionals and one of the best systems there is a need to explore the ways and means to bring equity in access to health professionals and institutions (Lin and Chang-tseh, 2006). This needs a joint commitment from both private and public sector.

Tele-clinic initiated by some Indian hospitals is one of

the innovative mixtures of technology and health protection supplement. It is an attempt to introduce ICT in healthcare to improve the access to specialty care to those living in remote rural areas (Scott et al., 2002).

Practicing information is not just a function of availability of options, but depends on the supplementary policies that enable practicing in real life situations. Social orientation of private sector not only the government, the private sector should also be socially responsible. Counteracting to the complexities of epidemiological world, ICTs today are offering solutions that enable access to knowledge warehouse in the least time possible and dynamic communication networks, surpassing national and international limits (Metaxiotis, 2005).

In fact, the WHO has been instrumental in promoting e-health in a number of ways. Some of these organizations have been involved in e-health projects in different parts of the world. Communication among IT specialists internationally has not led to a true transfer of knowledge and experience among the key programs (Powell et al., 2005). They may also have limited authority and recognition. There is the necessity to understand the specific needs of the locality and to find appropriate solutions to address those needs (Christopher and Craig, 2009).

Conclusions

UAE is faced with challenges to the continued success of its health care system. Some of these challenges are uniquely emirates, while others are common to many other countries in the Gulf region or the Middle East. These challenges include geographic considerations, cost, demographics, service access, quality, accountability, and the integration of ICTs. However, the Gulf Region's transition to e-health faces a number of challenges: high adult illiteracy rates, tertiary institutions enrolment rates, dearth of ICT technical know-how. This calls for concerted domestic, complemented with external, investments in secular education, ICT equipment and infrastructure, e-health-related human resource capacities and Internet connectivity.

In order to improve access to health care, especially for the majority of emirates living in remote rural areas, there is urgent need to boost the availability and utilization of e-health services. Thus, universal access to e-health ought to be a vision for all countries in the Gulf region. The UAE is making significant strides in the development, implementation and ongoing management of ICTs within the context of an integrated e-health component to the provision and management of health care. Each country ought to develop a clear road map in a strategic e-health plan that will, over time, enable its citizens to realize that vision.

E-health is the natural culmination of the UAE Government cumulative e-health efforts, and will bring tremendous change to the society through increasing access, and equity of access, to healthcare for most of its

population. This in turn requires that issues pertaining to policy and procedure be addressed 'locally' and in a manner that effectively accomplishes knowledge transfer from the theory to a policy practice.

In conclusion, global collaboration and co-ordination would reduce the transaction costs inherent in knowledge administration and allow a more effective total use of scarce health-care resources. In order to improve access to health care, there is need to boost the availability and utilization of e-health services. Thus, universal access to e-health ought to be a vision for all countries in the Gulf region.

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Full Length Research Paper

Suicidal ideation in callers to a crisis hotline in Mumbai, India

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Suicide is a worldwide public health problem. The stigma associated with suicide often deters people from seeking help. Although, helplines are not rated as very effective therapeutically, they offer an opportunity for intervention for people in crisis. The present study examined the characteristics of people attending an outpatient service after establishing an initial contact during an emotional crisis with a helpline in Mumbai, India. A total of 15,169 clients called the service during the first five years of operation, of whom 9.2% reported suicidal ideation. About half (51.6%) of the callers who were given a referral to the affiliated outpatient clinic kept their appointments. While 38% of the outpatient clients did not have an Axis I or Axis II psychiatric disorder, 25% were diagnosed with schizophrenia and 17% with depression. In addition, 13% had a personality disorder and 7% substance abuse disorders. Female clients more often reported stress arising from financial problems, conflict with their in-laws, and pre-marital relationships than did male clients; male clients more often reported stress arising from employment, loss of reputation, and education than did female clients. The availability of a 24/7 mental health helpline, staffed by mental health professionals with back-up support from an outpatient psychiatric facility, can enhance community mental health services. Some of the problems encountered were mentioned and needed improvements were discussed.

Key words: helplines, suicidal ideation, referrals

INTRODUCTION

Suicide is a major public health problem worldwide, and approximately one million people commit suicide every year, with India contributing about 10% of these suicides (Bertolote and Fleischmann, 2005). In the year 2009, India recorded 127,151 individuals who died by suicide,

with a rate of 10.9 per 100,000 per year (<http://ncrb.nic.in/accddeaths.htm>). Suicide is difficult to prevent because of its unpredictable nature. Most individuals experiencing suicidal ideation do not contact health care facilities and, therefore, do not provide an opportunity for

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intervention and treatment.

Several effective steps for prevention have been proposed, including restricting access to common methods of suicide, adequate treatment of mental disorders (such as depression and substance abuse), and school-based interventions involving self-esteem enhancement, and the development of coping skills (Bertolete, 2004). However no single strategy is sufficient and effective prevention can be achieved only by a concerted and comprehensive approach, based upon multidisciplinary models with a people-centered focus.

If suicidal clients contact mental health services, there is an opportunity for intervention. However, in India, as a result of the stigma related to suicide and also legal issues (since attempting suicide is still a crime in India), people in crisis do not readily seek treatment. Non-government agencies can play a significant role in bridging the gaps in service utilization in India, and many of these organizations work within a public health framework, collaborating with other agencies to provide suicide prevention programs that are responsive to local community needs (Vijayakumar, 1994).

Helplines are one such initiative, and they offer an adjunct to existing services for the intervention and prevention for suicide. For example, a helpline in Karnataka, India, for those with HIV and AIDs has proved to be useful for callers (Alexander et al., 2011). Although helplines are limited in the quality of the therapy provided, research has demonstrated that helplines are valuable. They offer empathic listening and link individuals in crisis to available services (Bleach and Claiborn, 1974; Porter et al., 1997). Research has shown that helpline counselors are effective in evaluating callers for their risk of suicide-related behavior (Karver et al., 2010) and can, therefore, be of great use. However, helplines alone are not sufficient for handling all crisis situations, and helplines require support from other services such as psychiatric hospitals and outpatient counseling clinics that can provide medication and psychotherapy.

The present study attempted to document the benefits of combining a helpline service with psychiatric follow up for diagnosis, suicide risk assessment and treatment. If telephone helplines are supported by a team of professionals offering diagnostic and treatment facilities, the telephone service can respond more effectively to the mental health needs of the callers. This model can also help overcome the limitations of helpline counseling when dealing with acutely suicidal individuals. Since few helpline services ever have a sample of their callers evaluated by a psychiatrist, this study provides important insights into those who call helplines while in a suicidal crisis.

METHODOLOGY

This study was conducted in a counseling center catering for the needs of suicidal clients in a suburban catchment area in Mumbai,

India. The center has two components: a telephone helpline operating 24 h a day, 7 days a week, and a psychiatric outpatient facility, both located in a residential community. The psychiatric outpatient clinic offered facilities for the assessment of individuals by psychiatrists and other mental health professionals and also for treatment, including hospitalization. The outpatient clinic operates from 9 am to 5 pm and functions like a walk-in clinic. No prior appointment is required. All clients who contact the helpline and who are experiencing a suicidal crisis are offered further intervention at the outpatient clinic if this is deemed necessary. An attempt to resolve the crisis is always made during this first contact on the telephone, and this was facilitated by the fact that the telephone counselors were qualified psychologists and social workers (rather than volunteer paraprofessionals).

The sample for the study consisted of clients who visited the outpatient clinic after establishing initial contact with the helpline during a suicidal crisis in the years 2001 to 2006. Clients who called and who were in a suicidal crisis were given the opportunity to come for a face-to-face assessment within the next 24 h. If clients failed to appear for their appointment, it was not possible to locate them because of confidentiality; their telephone numbers were not requested. There are no data, therefore, on whether these clients went to other hospitals or clinics.

Qualified psychiatrists at the outpatient clinic examined these clients and developed a plan for their care. These psychiatrists were available from 11 am to 3 pm from Monday through Saturday. If a client required any counseling or medication, this was provided at the outpatient clinic. Those who were judged to require hospitalization were given a choice of affiliated hospitals, government and private, that had agreed to admit and treat clients on a priority basis. Clients were also given the option of follow-up treatment by just "dropping in" at the outpatient clinic when needed. The helpline was managed by trained clinical psychologists and social workers with masters' degrees, with experience in psychiatric assessment and treatment.

Data collection was carried using a semi-structured format for the clients who attended the outpatient clinic. All of the clients were evaluated by a psychiatrist.

RESULTS

Of the 15,169 subjects who called the suicide helpline during the five-year study period, only 1,391 (9.2%) reported suicidal ideation. More than half (51.7%) of the clients who were advised to visit the outpatient service did so. In these 718 clients, the frequency of ideation was persistent in 26.5%, significantly more so in women than in men (38.2% versus 18.6%) (Table 1). Some 5.9% reported definite plans for suicide, while another 11.4% had tentative plans. Women more often reported a history of attempted suicide than men (49.3% versus 12.6%).

A report of stress was equally common in men and women, but the nature of the stressors differed by sex. Financial problems were twice as common in women, while men reported more employment and relationship stressors (Table 1). Women reported more stress over pre-marital relationships (including pre-marital pregnancy), conflict with their in-laws and general harassment (especially from husbands who were addicted to drugs and alcohol), while men reported more stress from loss of reputation (A loss of reputation has been consistently reported as a motive for suicide in the national database

Table 1. Clinical characteristics of the outpatient clients.

Characteristic	Total (%)	Male (%)	Female (%)	p value
	n=718	n=430	n=288	for sex difference
Severity				
Persistent ideation	26.5	18.6	38.2	< 0.001
Plans				
No plans	82.7	80.0	86.8	< 0.001
Uncertain plans	11.4	15.8	4.9	
Definite plans	5.9	4.2	8.3	
Past suicide attempts				
None	72.7	87.4	50.7	< 0.001
1	4.2	3.3	5.6	
2	16.9	5.6	33.7	
> 3	4.6	3.0	6.9	
Stressors				
Financial	46.0	27.9	72.9	< 0.001
Employment	15.6	20.7	8.0	< 0.001
Relationship	33.6	37.2	28.1	0.012
Conflict with in-laws	13.5	5.4	25.7	< 0.001
Harassment	4.7	0.9	10.4	< 0.001
Loss of reputation	7.8	10.7	3.5	< 0.001
Chronic medical illness	3.2	4.7	1.0	0.007
Premarital pregnancy	3.8	0.0	9.4	< 0.001
Premarital relationships	12.1	1.9	27.4	< 0.001
Addiction in husband	12.1	0.0	30.2	< 0.001
Exams/education	32.0	34.9	27.8	0.046
Loans	40.1	53.5	20.1	< 0.001
Psychiatric history				
First contact	28.3	41.9	8.0	< 0.001

of people who commit suicide in India, probably because social reputation is correlated with the success and performance of an individual).

For 28.3% of the clients, this contact was their first mental health contact, and more women than men reported prior mental health contacts.

Among those who visited the outpatient clinic, all of whom were assessed by the staff using DSM-IV criteria, 25% were diagnosed with schizophrenia, 17% with depression, 13% with a personality disorder, and 7% with a substance abuse disorder. Thirty-eight percent had no Axis I or Axis II diagnosis.

Of the 131 clients who were advised to check into a psychiatric hospital, 71 did so. Of those clients treated on an outpatient basis, 43% dropped out of treatment. This high drop-out rate was primarily a result of the lack of available services in the different communities in which they lived and, therefore, the long distances that some

clients would have had to travel to the outpatient clinic and not a result of the psychopathology of the clients. The service did have arrangements with ten psychiatric clinics to which it could refer clients who lived near these clinics, but this was not sufficiently close to all of the clients.

DISCUSSION

There were two different types of people who contacted the helpline with suicidal ideation. Some callers felt that they were able to handle the current transient crisis and did not feel the need for further intervention, while other callers continued to be in crisis and wanted further assistance after the initial telephone discussion. The second group contained a higher proportion of women, and these women more often had a history of suicidal

behavior and previous psychiatric contacts. In the absence of the associated outpatient clinic that was available, it is unlikely that these clients would have gone to another hospital or clinic. The helpline offered this opportunity, providing a useful resource for the clients, motivating them to use the service, and bringing them into treatment much earlier than otherwise. Delay in accessing services is common among people suffering from depression who often avoid accepting referrals until the crisis becomes serious and acute.

This study indicates that it is useful, and perhaps important, to have outpatient psychiatric treatment available for those who call a crisis helpline. Roughly 5% of the callers to the helpline were given a referral to the outpatient clinic which they kept, and 60% of these were found to have an Axis I or Axis II psychiatric disorder. The presence of the outpatient clinic provided an opportunity to provide treatment for these clients, and a small proportion was judged to be in need of hospitalization.

Those working on the helpline experienced several problems. The helpline counselors had a high rate of turnover which necessitated recruiting and training counselors on a continual basis. Part of this problem was a result of inability of the service to pay the counselors a good wage, and partly from burn-out as a result of the stressful nature of conducting crisis intervention with callers. A second problem was publicizing the helpline so that people in region knew of its availability. The helpline received a large number of prank and nuisance calls, particularly at night, which tied up the lines and frustrated the counselors. Finally, since this type of service was a new concept, some callers did not understand the service provided. Some wanted information rather than counseling, while others had too high expectations about what the service could provide.

In order to make the service more community-friendly, more coordination with other local agencies is required, as well as sufficient funding to provide a comprehensive service, contacting and talking to community groups in order to publicize the service and explain what it can do, and educating the public through the media (newspapers, magazines, radio, television and the Internet) about the service.

A study of attempted suicides in Mumbai, India, found that 40% did not qualify for a psychiatric diagnosis (Parkar et al., 2008), but studies of completed suicide in India do report a higher incidence of psychiatric disorder (Vijayakumar and Rajkumar, 1999). The present results, indicating that 38% of the clients seen at the outpatient clinic did not have a psychiatric disorder, are consistent with the studies of attempted suicides in India.

However, 62% of the clients seen at the outpatient clinic did merit a psychiatric diagnosis. Services that have suicidal clients need to be equipped for comprehensive and meaningful culture-specific measures for dealing with the psychological and social problems facing the clients and for ameliorating the risk factors present in these

individuals. Since there is stigma associated with suicidal behavior and with seeking treatment, programs should be developed to increase the general public's understanding of suicide and the need for treatment in order to decrease this stigma (Manorantjitham et al., 2005).

It would be of interest to explore why some clients dropped out of psychotherapy. It could be that the psychotherapy was successful, and they felt no need for further psychotherapy. On the other hand, it could be that they found psychotherapy unhelpful or because getting to the clinic was too difficult. Future research is required to find out the reasons why clients drop-out of treatment.

Although attempting suicide is a crime in India, having suicidal ideation is not an offense. Thus, clients are not reluctant to call helplines or attend psychiatric clinics, because of any legal issues. Furthermore, despite Indian law, many that attempted suicides attend psychiatric clinics and receive treatment.

The implications of this study are: (1) helplines are helpful for clients in crisis; (2) the model of a helpline supported by a psychiatric outpatient clinic with priority appointments seems to be more useful than helplines alone; and (3) this system offers early identification of psychiatric disorder, with clients evaluated and diagnosed early in the course of their disorder, as well as continuity of care afterwards.

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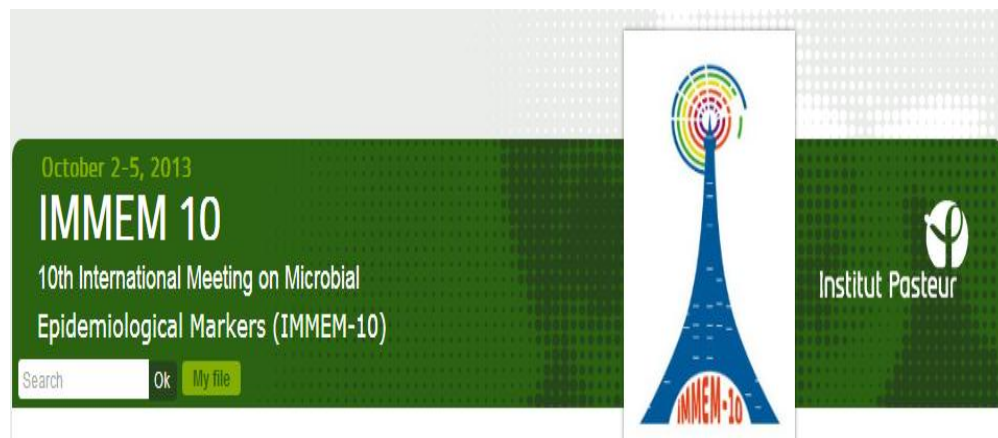
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