

Original Research

View Article Online



Received 19 January 2022

Revised 05 February 2022

Accepted 16 February 2022

Available online 05 April 2022

Edited by Manoj G Kulkarni

KEYWORDS:

Forest Bathing
knowledge acquisition
knowledge sharing
Health Professionals
FB prescription

Natr Resour Human Health 2022; 2 (4): 433-442
<https://doi.org/10.53365/nrfhh/146743>
eISSN: 2583-1194
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Willingness to Acquire, Share Knowledge and Prescribe Forest Bathing by Health Professionals in Nigeria

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ABSTRACT: Forest bathing (FB) as a medicine is gaining popularity across the globe but little is known about this medicine in Nigeria. Health professionals (HPs) are central to the usage of this medicine through their communications and prescriptions. Therefore, we investigated HPs willingness to acquire, share knowledge and prescribe FB in Nigeria. Cross-sectional data from the 371 HPs (Doctors, n = 215; Nurses, n = 103; Pharmacists, n = 53) from teaching and military hospitals in Port Harcourt were analyzed. About half (49.9%) of HPs were aware of the importance of forest, mostly as a source of drugs/herbs. However, only 16.4% of HPs were aware of FB of which just 4.6% had prescribed it to patients. Online internet search and seminars/conferences were dominant approaches for the acquisition and sharing of knowledge, respectively. While multinomial logistic regression results indicated age as a significant factor influencing the willingness of HPs to acquire knowledge about FB, years of experience were found as a significant factor predicting the willingness of HPs to share knowledge about FB. Gender specificity analyses indicated female HPs more willing to prescribe FB than male counterparts. The results of this study may significantly improve HPs awareness and their willingness for health communication research/practices of FB as medicine in Nigeria.

1. INTRODUCTION

Forest bathing (FB) as a medicine have become a topic of increasing importance of scientific and professional discussions across the globe in most recent times (Bach et al., 2021; Clarke et al., 2021; Farkic et al., 2021; Mathias et al., 2020; Mcewan et al., 2021; Roviello et al., 2021; Seo et al., 2021; Wen et al., 2019). When Japanese Forestry Agency coined the term “FB or Shinrin-yoku” (absorbing the forest atmosphere) in 1982, the health-improving concept was established as a broad interdisciplinary field between medicine, forestry, and sport tourism (Farkic et al., 2021; Li et al., 2007). Its recommendation to patients is often being considered as more effective for overall healing and wellbeing (Hansen et al., 2017; Li et al., 2007). Those health-improving effects of forests have been suggested to be attributed essentially among other factors to inhalation of biogenic volatile organic compounds (BVOCs) including phytoncides emitted by trees (Li et al., 2007; Roviello et al., 2021). Scientifically proven evidences have shown that exposure to forests can exert specific preventive and therapeutic health benefits such as lowering heart rate and

blood pressure, reducing stress hormone production, boosting immunity, improving overall feelings, causing deep sleep and increasing expression of anti-cancer proteins, improving mental wellness and birth delivery, enhancing surgery wound healing, preventing obesity, cardiovascular disease, gallbladder disease, diabetics, and osteoporosis (Frumkin et al., 2017; Han et al., 2016; Kuo, 2015; Lee et al., 2019; Li, 2019; Li et al., 2007; Wen et al., 2019).

The inclusion of FB into national health care services for preventive and certain mental health cases is well established in Japan, South Korea, China, and Norway (Clarke et al., 2021; Hansen et al., 2017; Li et al., 2007; Miyazaki, 2018; Roviello et al., 2021; Tsunetsugu et al., 2009). Thus, its recommendations as an effective and promising medicine against anxiety, depression, stress, anger, and addiction have been documented (Furuyashiki et al., 2019; Kotera & Rhodes, 2020; Wen et al., 2019). The popularity of FB is increasing worldwide and a growing number of expanding studies and commitments are ongoing in the UK (Mcewan et al., 2021), Australia (Lauder, 2019), Germany, Scotland (Farkic et al., 2021), and the US (Forum, 2019) towards the full

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incorporation of FB into their national health care treatment plans (Mcewan et al., 2021). Increased commitments regarding the training of certified forest therapists and provision of accessible quality forest cover for bathing have been promoted across the globe. Such laudable commitments specifically for public FB at international and national/local levels included; the establishment of the Japanese International Society of Nature and Forest Medicine, the American Association of Nature and Forest Therapy Guides and Programs, Global, the Forest Therapy South Eastern Europe, FB Institute in the UK, The FB Club in the US (Farkic et al., 2021; Forum, 2019). These organisations have played considerable roles in widespread information about the practice of FB at different international forums online. In Africa, the few shreds of evidence of practicing FB found displayed online originated from South Africa (Africa (2021); Essences (2021); Forum (2019)).

While online health information has emerged as a leading avenue in health communication globally (Lee et al., 2019; X. Wang et al., 2021), the attention has been drawn to the fundamental role of HPs regarding the plan implementation of FB at national levels (Bach et al., 2021; Meyer & Burger-Arndt, 2014). However, our reconnaissance inquiries have shown that virtually nothing is known about FB among the Health professionals (HPs) in Ogun, Oyo, and Rivers States, Nigeria – a country listed among the largest disease burden of the world by WHO (Vanguard, 2018). The global interests now in exploring the overall health-improving effects of forests have come to the fore involving collaborative efforts between medical practitioners and foresters (Bach et al., 2021; Doimo et al., 2020; Meyer & Burger-Arndt, 2014) in particular during this evolving COVID-19 pandemic (Roviello et al., 2021). The role of HPs in the communication of FB has become more important worldwide (Beresford-Kroeger, 2019) but has not been explored in Nigeria. FB, being more patient-focused if initiated by HPs can considerably not only reduce the disease burden that continues to pose a major threat to human public health but also help to increase forest cover and its sustainable conservation in Nigeria. In this study, we analyzed the level of HPs awareness, their willingness to acquire, share knowledge about FB, and to prescribe FB in Port Harcourt, Nigeria. The results of this study may significantly improve HPs awareness and their willingness for health communication research/practices about FB as medicine in Nigeria.

2. METHODS

2.1. Study Hospitals

The study was conducted in the University of Port Harcourt Teaching Hospital (UPTH) and Military Hospital (MH), both in Port Harcourt, Nigeria. The distance between the two hospitals is around 21.5km. While the UPTH (04°53'3" N and 06°55'43" E) is a tertiary health care teaching and research facility for public health care delivery, MH (04°48'53" N and 07°00'15" E) is an Armed Forces health facility for military personnel and their family members health care services. The UPTH has in its employment about 1387

HPs including consultants, resident doctors, pharmacists, and nurses. The HPs in the service of MH is around 88 including doctors, pharmacists, and nurses. These classes of health personnel are the targeted HPs for the study. Trees are somewhat moderately part of the facilities, many of which are in the form of shade and avenue trees. *Terminalia mantaly*, *Khaya* sp., *Mangifera indica*, *Hura crepitans*, *Polyalthia longifolia*, *Terminalia catappa*, *Hura crepitans* including Palm family (*Roystonea regia* and *Elaeis guineensis*) are dominant tree species within the two facilities. The two hospitals share common climatic conditions; typically tropical moist rainforest experiencing heavy downpour throughout the year but with reduced frequency in the month of December to March. The average minimum and maximum temperature is around 22.54 °C and 31.03 °C, respectively. The relative humidity levels tend to vary from 58.97 to 94.50% and the average annual rainfall is greater than 2000 mm (Uko & Tamunobereton-Ari, 2013).

2.2. Sampling design and data collection

Prior to the commencement of the detailed survey in June 2019, several reconnaissance visits were made to the two hospitals, and inputs necessary for designing a reliable data collection method were obtained. In order to reach the broad respondents, a Snowball sampling approach was employed to serve 500 copies of pre-tested questionnaires to participating HPs but 371 representing 74.2% were retrieved and analyzed. Doctors (n = 215), Nurses (n = 103), and Pharmacists (n = 53), of which UPTH was (n, 283), and MH was (n, 88).

2.3. Statistical analyses

SPSS version 22 software was implemented for statistical analysis. Descriptive statistics was used to identify the level of awareness about FB, methods of knowledge acquisition, and sharing in medicine. Multinomial regression logistics was performed at $p < 0.05$ to test the effect of predictor variables on the likelihood of responding yes or maybe compared to No for FB information on the acquisition, sharing, and prescription to patients.

Willingness was evaluated from the respondents with options ranging from Yes, Maybe, to No, which makes up the dependent variable for the model. This type of measurement offers no definite distance between the categories of “No”, “Maybe”, and “Yes”, and as such, multinomial logistic regression was performed to assess the determinants affecting willingness to acquire, share and prescribe as adopted by Shin and Mccann (2018). Thus, the model is specified as;

$$\Pr (y_i = j) = \frac{\exp (x_i \beta_j)}{\sum_{k=1}^3 \exp (x_i \beta_k)}$$

Where: $i = 1, \dots, n$ and $j = 1, 2, 3$

$$y_i = \begin{cases} 1 & \text{if respondent chose "Yes"} \\ 2 & \text{if respondent chose "Maybe"} \\ 3 & \text{if respondent chose "No"} \end{cases} \quad (1)$$

3. RESULTS

3.1. Demographic information of the HPs

As shown in Table 1, the gender ratio between the male and female HPs who participated in the study was almost 1:1. The frequency of the age group of the participants indicated an increasing trend from 21-30 years to the peak at age 31-40 years, and then considerably decreases to age 51-60 years (Table 1). Over two-fifths (44.2%) of the participants reported having an MBBS degree, and almost three-fifths (58.0%) were medical doctors (Table 1). Close to two-fifths (36.9%) of the participants indicated their monthly salary was between ₦ 100,000 – ₦ 200,000, and 73.8% of them indicated they have practiced not more than 10 years (Table 1).

3.2. Bodies regulating medical activities, drug approval and active associations of the HPs

The list of bodies regulating medical activities, drug approval, and active associations of the HPs who participated in the study was summarized in Table 2. Based on the computed percentage frequency distribution, the top 3 popular bodies regulating medical activities included: MDCN, NMA, and NMCN. The dominant body responsible for drugs/medicines approval was listed to be NAFDAC. The participants listed NMA, NMCN, and ARD as the top 3 most active professional associations (Table 2).

3.3. Awareness of health benefits of forest and FB

Of 371 participants, 185 representing 49.9% of the HPs indicated awareness about the health benefits of the forest. The health benefits of forest listed included: research and raw material for drugs development (50.8%); source of herbs (28.1%); protection from ultraviolet rays, and skin cancer (11.9%); and spot for relaxation and stress relief (9.2%). However, only 61 of the participants representing 16.4% of the HPs indicated awareness of FB of which only 17 (4.6%) expressed they have prescribed FB for stress and psychological related illnesses. What FB means by HPs who indicated awareness included: treatment for stress/high blood pressure relief (27.9%); cure for mental illness (21.3%); treating ailments with nature (19.7%); form of diversional therapy (19.7%); Psychological therapy (11.5%). The limitations to FB prescriptions expressed included: insecurity (53.0%); not standardized practice in Nigeria (29.4%); and no quality forest cover around (17.6%). Over three-fifths, (63.9%) of the HPs who were aware indicated they have had knowledge of FB for over 10 years: 24.6% (5-10 years), and 11.5% (less than 5 years).

3.4. Knowledge acquisition and sharing on prescription of medicines by HPs

The methods of knowledge acquisition and information sharing on the prescription of medicines by HPs are depicted in Figure 1 and 2. The top 3 methods of knowledge acquisition listed included: online/internet search (59.8%);

Table 1

Demographic information of the HPs (N = 371)

Features	variables	Frequency	Percentage
Gender	Male	183	49.3
	Female	188	50.7
Age (years)	21-30	102	27.5
	31-40	132	35.6
	41-50	102	27.5
	51-60	35	9.4
Highest Education	MBBS	164	44.2
	B.Pharm	53	14.3
	Nursing Certificate	45	12.1
	BSc. Nursing	58	15.6
	Professional Diploma	5	1.3
	FWACP	7	1.9
	PhD	38	10.2
Profession	Post graduate residency	1	0.3
	Medical doctor	215	58.0
	Nurse	103	27.8
	Pharmacist	53	14.3
Name of Hospital	UPTH	283	76.2
	MH	88	23.8
Salary	<N100,000	69	18.6
	₦100,000 – ₦200,000	137	36.9
	₦201,000 – ₦300,000	68	18.3
	₦301,000 – ₦400,000	48	12.9
	> ₦400,000	49	13.2
Practice Years	<1year	23	6.2
	1-5years	147	39.6
	6-10years	127	34.2
	11-15years	33	8.9
	16-20years	23	6.2
	> 20years	18	4.9

MBBS– Bachelor of Medicine and Bachelor of Surgery

B.Pharm– Bachelor of Pharmacy

BSc.Nursing – Bachelor of Science in Nursing

FAWCP– Fellow of West African College of Physicians

seminar/conference (43.9%); and continuous medical education (43.6%) (Figure 1). Regarding the information-sharing methods, over three-fifths (60.9%) of the HPs listed seminars and conference: presentations and clinical teachings (27.0%), step down to fellow colleagues (20.8%), health education and talks (14.6%), electronic sharing (14.6%), and ward/teaching rounds (6.4%) (Figure 2).

3.5. Willingness to acquire, share knowledge and prescribe FB by HPs

3-8 reported the willingness to acquire, share, and prescribe FB by HPs. Descriptive statistics of willingness to acquire, share and prescribe FB by HPs indicated a very high proportion (90.0%) of HPs' willingness to acquire knowledge about FB. However, the proportion of HPs who indicated a willingness to share information about FB, and prescribe FB decreased to 73.3% and 71.2%, respectively (Table 3). Although 40.7% of HPs did not respond, various reasons for their different responses to their willingness to or not to prescribe included: helping to establish awareness about the potency of FB (14.8%);

Table 2
Bodies regulating medical activities, drug approval and active associations of HPs (N = 371)

Variables	Bodies	Frequency	Percentage (n = 371)
Boards/bodies regulating medical activity	MDCN	194	52.3
	NMA	115	31.0
	NMCN	105	28.3
	PCN	47	12.7
	PSN	34	9.2
	NANNM	9	2.4
	NDA	8	2.2
Boards/bodies approving drugs/medicines	NAFDAC	353	95.1
	NDLEA	53	14.3
	PCN	43	11.6
	PAN	17	4.6
	WACS	1	0.3
	NMA	147	39.6
	NMCN	95	25.6
Associations	ARD	85	22.9
	NDA	64	17.3
	MDCN	59	15.9
	NANNM	49	13.2
	PSN	43	11.6
	CMDA	35	9.4
	AHAP	24	6.5
PANS	17	4.7	
PCN	13	3.5	

MDCN: Medical and Dental Council of Nigeria; NMA: Nigerian Medical Association; NDA: Nigerian Dental Association; NMCN: Nursing and Midwifery Council of Nigeria; PSN: Pharmaceutical Society of Nigeria; PCN: Pharmacists Council Of Nigeria; NAFDAC: National Agency for Food and Drug Administration Control; NDLEA: National Drug Law Enforcement Agency; PANS: Pharmaceutical Association of Nigerian Students; CMDA: Christian Medical and Dental Association; WACS: West African College of Surgeons; AHAP: Association of Hospital and Administrative Pharmacists of Nigeria; NANNM: National Association of Nigeria Nurses and Midwives

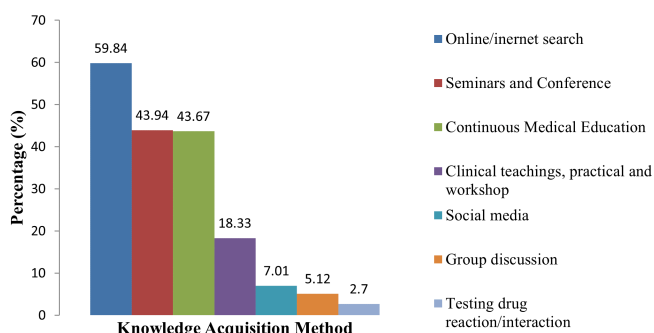


Figure 1. Knowledge acquisition methods among HPs

if scientifically proven (14.6%); not an area of specialization (9.4%); help to improve general well being (7.8%); not totally convinced (6.7); insecurity (3.2%); and if patients are willing (2.7%) (Table 3).

From the inferential statistics, only the age category was a significant factor predicting HPs willingness to acquire knowledge about FB. HPs of 20-30 years (-16.244/-16.383), 31-40years (-15.962/-15.722), and 41-50years (-16.816/-16.006) are significantly less likely to acquire information on FB compared with those above 50 years of age (Table 4). As

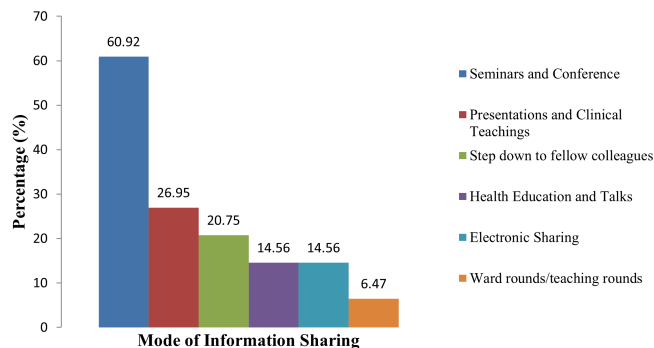


Figure 2. Knowledge sharing methods among HPs

for sharing information about FB, only the category of years of experience was found significant. That is, HPs with <1 years (-17.911), 1-5years (-16.025), 6-10years (-16.513), 11-15years (-16.546) and 16-10years (-16.620) of working experience are significantly less likely to share information on FB compared with those who have worked above 20 years (Table 5). As for prescription, the regression model has no significant prediction of HPs likelihood to prescribe FB with regards to their individual characteristics (Table 6). However, regarding gender specificity analysis, the model significantly predicted female HPs participants' willingness to prescribe FB for profession, years of practice, income, and age predictors. It estimated that medical doctors (2.013) are more likely to prescribe than pharmacist. It also predicted younger female medical personnel and those with lesser years of experience and more likely not to prescribe than those within the age bracket of 51-60 years and above 20 years of experience. More so, younger females and those with lower income are more likely to consider (Maybe) prescribing FB than their colleagues of 51-60 years of age and above ₦400,000.00 income (Table 7). The model significantly predicted male respondent's willingness to prescribe FB for only the <1year category of years of practice. It predicted medical personnel with less than 1 year of experience more likely to prescribe FB than those with above 20 years of experience (Table 8).

4. DISCUSSION

HPs are one of the main targets of FB and its prescriptions (Frank, 2021; Meyer & Burger-Arndt, 2014). Understanding HPs knowledge about FB can be a pivotal step in initiating the nation's widespread communication, and commitments towards FB prescription in Nigeria. HPs participants in this study showed a very low level of awareness regarding FB and its prescription. These results confirmed that HPs need to be further informed about FB owing to their key role in the implementation of the medical strategy of the forests. In spite of the reported use of online/internet search as the top source of knowledge acquisition by the participated HPs (Figure 1), knowledge deficiency about FB remained high. The low level of awareness found in this study may be explained by the orchestrated alarms frequently raised by orthodox health professionals about forest-based (herbal)

Table 3

Descriptive statistics of willingness to acquire, share knowledge, and prescribe FB by HPs

Variables	Responses	Frequency	Percentage
Willingness to acquire knowledge	Yes	334	90.0
	No	6	1.6
	May be	31	8.4
	Total	371	100.0
Sharing of information	Yes	272	73.3
	No	19	5.1
	May be	80	21.6
	Total	371	100.0
Willingness to prescribe	Yes	264	71.2
	No	55	14.8
	May be	52	14.0
	Total	371	100.0
Reasons for willingness to or not to prescribe	No response	151	40.7
	It will help to establish awareness about the potency of forest bathing	55	14.8
	If scientifically proven	54	14.6
	Not an area of specialization	35	9.4
	Help to improve general wellbeing	29	7.8
	Not totally convinced	25	6.7
	Insecurity	12	3.2
	If patients are willing	10	2.7
	Total	371	100.0

medicines in Nigeria (Aiyelaja, 2019). This could also be due to the communication gap between bodies regulating medical activities, drug approval, and active associations of the HPs. This highlights the importance of regulating bodies' involvement in collaborative seminars and conferences at the international level, acquiring emerging information that can be considered at the national level for implementation (Ayanbode & Nwagwu, 2021; Meyer & Burger-Arndt, 2014). Nevertheless, they indicated more increase in willingness to acquire than sharing knowledge about FB, which may have important health impacts in the long-term prescription of FB. These results are in line with previous studies (Karjalainen et al., 2010; Sukums et al., 2014). Karjalainen et al. (2010) reported that the lack of health practitioners' awareness of the potential of forests for improving human health as one of the major challenges. Sukums et al. (2014) reported that most health workers in rural African primary health facilities had little computer knowledge, but had positive attitudes and willingness towards adoption of technology.

Table 4

Multinomial logistic regression results: Effect of predictor variables on the likelihood of responding "Yes" or "Maybe" compared to "No" for FB knowledge acquisition

Personal Characteristics	Yes			Maybe		
	Estimate	Std. Error	Wald	Estimate	Std. Error	Wald
Profession						
Medical doctor	-	1.401	0.014	1.295	1.626	0.634
Nurse	0.166	-	-	0.804	1.579	0.259
Pharmacist (base)	0 ^b	-	-	0 ^b	-	-
Practice Years						
< 1 year	2.217	1.470	2.275	4.734	0.000	0.000
1 – 5 years	-	4982.676	0.000	-	4982.676	0.000
6 – 10 years	13.661	-	-	12.751	-	-
11 – 15 years	-	4982.676	0.000	-	4982.676	0.000
16 – 20 years	15.433	-	-	14.804	-	-
> 20 years (base)	0.875	7011.039	0.000	1.687	7011.039	0.000
	-	4982.676	0.000	-	4982.676	0.00
	16.779	-	-	16.464	-	-
	0 ^b	-	-	0 ^b	-	-
Income						
< ₦100,000	-	2.334	0.839	-	2.505	0.653
₦100,000 – ₦200,000	2.138	-	-	2.024	-	-
₦201,000 – ₦300,000	-	1.959	0.299	-	2.080	0.205
₦301,000 – ₦400,000	1.071	-	-	0.942	-	-
> ₦400,000 (base)	-	1.861	0.000	-	2.015	0.289
	0.023	-	-	1.084	-	-
	15.746	3629.128	0.000	15.947	3629.128	0.000
	0 ^b	-	-	0 ^b	-	-
Gender						
Female	0.740	0.976	0.575	0.324	1.058	0.094
Male (base)	0 ^b	-	-	0 ^b	-	-
Age						
21 – 30 years	-	1.783	82.972	-	1.727	89.983
31 – 40 years	16.244*	-	-	16.383*	-	-
41 – 50 years	-	1.424	125.561	-	1.283	150.123
51 – 60 years (base)	15.962*	-	-	15.722*	-	-
	-	0.856	385.814	-	0.000	0.000
	16.816*	-	-	16.006*	-	-
	0 ^b	-	-	0 ^b	-	-

Notes: Superscripts *indicate statistical significance at 5%, "No" is the base category to which the other groups, "Yes" and "Maybe" are compared.



Table 5

Multinomial logistic regression results: Effect of predictor variables on the likelihood of responding “Yes” or “Maybe” compared to “No” for FB knowledge sharing

Personal Characteristics	Yes			Maybe		
	Estimate	Std. Error	Wald	Estimate	Std. Error	Wald
Profession						
Medical doctor	-1.575	1.202	1.716	-1.739	1.238	1.973
Nurse	0.942	1.123	0.704	1.471	1.172	1.577
Pharmacist (base)	0 ^b	-	-	0 ^b	-	-
Practice Years						
< 1 year	17.911*	1.718	108.741	17.625*	1.686	109.343
1 – 5 years	16.025*	1.622	97.653	16.279*	1.540	111.734
6 – 10 years	16.513*	1.473	125.665	16.994*	1.361	155.896
11 – 15 years	16.546*	1.520	118.474	16.847*	1.416	141.616
16 – 20 years	16.620*	0.774	461.135	16.409*	0.000	0.000
> 20 years (base)	0 ^b	-	-	0 ^b	-	-
Income						
< ₦100,000	2.547	1.493	2.909	2.218	1.594	1.938
₦100,000 – ₦200,000	0.995	1.366	0.531	0.155	1.437	0.012
₦201,000 – ₦300,000	0.234	1.353	0.030	0.287	1.417	0.041
₦301,000 – ₦400,000	0.948	1.243	0.582	0.473	1.304	0.132
> ₦400,000 (base)	0 ^b	-	-	0 ^b	-	-
Gender						
Female	0.093	0.579	0.026	0.255	0.617	0.171
Male (base)	0 ^b	-	-	0 ^b	-	-
Age						
21 – 30 years	1.056	1.446	0.533	0.712	1.540	0.214
31 – 40 years	0.057	1.290	0.002	0.279	1.371	0.025
41 – 50 years	0.107	1.188	0.008	0.389	1.254	0.096
51 – 60 years (base)	0 ^b	-	-	0 ^b	-	-

Notes: Superscripts *indicate statistical significance at 5%, “No” is the base category to which the other groups, “Yes” and “Maybe” are compared.

Table 6

Multinomial logistic regression results: Effect of predictor variables on the likelihood of responding “Yes” or “Maybe” compared to “No” for forest FB prescription

Personal Characteristics	Yes			Maybe		
	Estimate	Std. Error	Wald	Estimate	Std. Error	Wald
Profession						
Medical doctor	0.905	0.475	3.630	1.198	0.638	3.530
Nurse	0.696	0.451	2.388	0.423	0.680	0.387
Pharmacist (base)	0 ^b	-	-	0 ^b	-	-
Practice Years						
< 1 year	0.133	1.221	0.012	0.392	1.505	0.068
1 – 5 years	0.568	1.118	0.258	0.305	1.377	0.049
6 – 10 years	0.790	1.052	0.564	0.445	1.286	0.120
11 – 15 years	0.502	1.103	0.207	0.063	1.313	0.002
16 – 20 years	0.991	1.159	0.731	0.298	1.423	0.044
> 20 years (base)	0 ^b	-	-	0 ^b	-	-
Income						
< ₦100,000	1.201	0.836	2.062	1.178	1.192	0.976
₦100,000 – ₦200,000	0.813	0.768	1.121	0.122	1.021	0.014
₦201,000 – ₦300,000	0.024	0.754	0.001	0.946	0.985	0.922
₦301,000 – ₦400,000	0.155	0.745	0.043	0.322	0.948	0.116
> ₦400,000 (base)	0 ^b	-	-	0 ^b	-	-
Gender						
Female	0.017	0.347	0.002	0.444	0.457	0.943
Male (base)	0 ^b	-	-	0 ^b	-	-
Age						
21 – 30 years	0.055	1.013	0.003	0.194	1.219	0.025
31 – 40 years	0.575	0.966	0.354	0.423	1.138	0.138
41 – 50 years	1.331	0.889	2.240	1.461	1.031	2.006
51 – 60 years (base)	0 ^b	-	-	0 ^b	-	-

Notes: Superscripts *indicate statistical significance at 5%, “No” is the base category to which the other groups, “Yes” and “Maybe” are compared.

Table 7

Multinomial logistic regression results: Effect of predictor variables on the likelihood of responding “Yes” or “Maybe” compered to “No” for FB prescription by female HPs

Personal Characteristics	Yes			Maybe		
	Esti- mate	Std. Error	Wald	Esti- mate	Std. Error	Wald
Profession						
Medical doctor	2.013*	0.827	5.925	2.251*	1.094	4.233
Nurse	1.010	0.577	3.059	0.032	0.909	0.001
Pharmacist (base)	0 ^b	-	-	0 ^b	-	-
Practice Years						
< 1 year	-	13017.448	0.000	-	13017.448	0.000
	17.191*			34.958		
1 – 5 years	-	13017.448	0.000	-	13017.448	0.000
	16.256*			35.983		
6 – 10 years	-	13017.448	0.000	-	13017.448	0.000
	16.274*			35.481		
11 – 15 years	-	13017.448	0.000	-	13017.448	0.000
	16.686*			34.853		
16 – 20 years	-	13017.448	0.000	-	15475.758	0.000
	15.972*			53.136		
Above 20 years (base)	0 ^b	-	-	0 ^b	-	-
Income						
< N100,000	-	1.441	0.121	16.930	1.529*	122.685
	0.501					
N100,000 – N200,000	0.037	1.411	0.001	17.719	1.396*	161.054
N201,000 – N300,000	0.493	1.456	0.114	17.479	1.398*	156.212
N301,000 – N400,000	-	1.359	1.228	16.703	0.000*	0.000
	1.506					
Above N400,000 (base)	0 ^b	-	-	0 ^b	-	-
Age						
21 – 30 years	-	1.776	101.870	-	1.303*	163.681
	17.927*			16.670		
31 – 40 years	-	1.740	107.146	-	1.158*	215.977
	18.010*			17.016		
41 – 50 years	-	1.581	137.189	-	0.000*	0.000
	18.516*			18.488		
51 – 60 years (base)	0 ^b	-	-	0 ^b	-	-

Notes: Superscripts *indicate statistical significance at 5%, “No” is the base category to which theother groups, “Yes” and “Maybe” are compared.

Table 8

Multinomial logistic regression results: Effect of predictor variables on the likelihood of responding “Yes” or “Maybe” compered to “No” for FB prescription by male HPs

Personal Characteristics	Yes			Maybe		
	Esti- mate	Std. Error	Wald	Esti- mate	Std. Error	Wald
Profession						
Medical doctor	0.520	0.674	0.594	0.584	0.869	0.451
Nurse	0.457	0.879	0.271	1.203	1.185	1.031
Pharmacist (base)	0 ^b	-	-	0 ^b	-	-
Practice Years						
< 1 year	19.533*	1.722	128.658	20.000	0.000	0.000
1 – 5 years	0.886	1.470	0.363	0.816	1.756	0.216
6 – 10 years	1.558	1.361	1.311	0.462	1.612	0.082
11 – 15 years	0.325	1.319	0.061	0.229	1.552	0.022
16 – 20 years	1.322	1.387	0.908	0.510	1.630	0.098
Above 20 years (base)	0 ^b	-	-	0 ^b	-	-
Income						
< N100,000	-	1.356	1.788	-	8590.329	0.000
	1.813			20.402		
N100,000 – N200,000	-	1.141	2.546	-	1.345	0.369
	1.821			0.817		
N201,000 – N300,000	-	1.048	0.531	0.632	1.232	0.263
	0.764					
N301,000 – N400,000	1.214	1.265	0.920	1.484	1.411	1.107
Above N400,000 (base)	0 ^b	-	-	0 ^b	-	-
Age						
21 – 30 years	1.432	1.412	1.029	0.102	1.672	0.004
31 – 40 years	0.006	1.176	0.000	-	1.388	0.075
				0.381		
41 – 50 years	-	1.014	0.569	-	1.180	0.950
	0.765			1.150		
51 – 60 years (base)	0 ^b	-	-	0 ^b	-	-

Notes: Superscripts *indicate statistical significance at 5%, “No” is the base category to which theother groups, “Yes” and “Maybe” are compared.

Although 90.0% of the participated HPs expressed willingness to acquire more knowledge about FB, the multinomial logistic regression results demonstrated that the willingness to acquire more knowledge about FB was influenced by only demographic aspect of age. HPs of 50 years old and above were significantly indicated willingness to seek more information about FB. This suggests the preparedness of older HPs to update themselves more about FB than younger colleagues. The possible explanation for this may be a national staffs recruitment/tutorial culture, where younger colleagues are like trainees acquiring practical knowledge and experience from older/senior colleagues (Asemahagn, 2014). Culturally in Nigeria, older people in respective of their professions are

known to be vast in knowledge, thus this result implied they are ready to be more abreast of new emerging medicine for younger colleagues to learn from them.

The percentage of the participated HPs willing to share knowledge about FB is similar to the findings of Asemahagn (2014) who reported 70.0% of the HPs willingness to share knowledge, and experience with their colleagues in hospitals under the Addis Ababa health bureau, Ethiopia. The significance of willingness to share knowledge due to influence of year of experience indicated health professionals of 20 years and above of practice are likely to share more knowledge about FB. The longer and more actively one has practiced within a profession the more likely the experienced is to share knowledge. The fear that sharing knowledge by inexperienced HPs may jeopardize their job security is one probable explanation for this result. As experience and age are intertwined, this result is in agreement with findings of Balogun (2014) who reported that willingness of health workers to share tacit knowledge increased with age in Nigeria.

As for gender specificity, the statistical analyses demonstrated Female HPs as being more likely to prescribe FB than male counterparts. Previous studies have found that women are more emotional (Fischer et al., 2004), and they significantly communicate more on health-related issues than men (Balogun, 2014; Lemire et al., 2008; Nolke et al., 2015). Similarly, Seo et al. (2021) reported that female visitors viewed forest path trekking as relaxation and healing but male visitors viewed forest path trekking as activities, and as such, they tended to likely prescribe FB more than males. A practical explanation for this result is that women are leading in response to health-related issues and caring responsibilities in the family and society than men (Dillip et al., 2018; Parker, 2015).

5. LIMITATIONS AND FUTURE RESEARCH

The present study has some limitations. Firstly, a snowball sampling approach was used to administer questionnaires instead of the face-to-face method. An important demographic factor, marital status which may have impacted positively on willingness results was not included in the analysis due to very low response from the participants. Secondly, the study was conducted in just two hospitals within one out of thirty-six States of Nigeria, thus, the results may not be generalized. Future studies should be conducted nationwide while taking demographic aspect of marital status and other variables such as availability of public internet facilities into considerations. The results of this study will be useful for professionals, academics, and the government to initiate studies on the chemistry of native and introduced trees/shrubs regarding the presence of health-improving BVOCs including phytoncides (Kim et al., 2020; Li et al., 2007; S.Y. Wang, 2019) and their potential emission properties in order to select the best candidates for FB gardens and for inclusion in environmental forestry restoration plan. Though health-improving of forests in general have been linked with emissions of chemical compounds in particular phytoncides (Li et al., 2007) but chemicals studies of specific

forest species native to North America have revealed Balsam poplar and white pine as outstanding candidates for FB in terms of their quality and quantity releasable BVOCs (Ouellet et al., 2016; Toma & Bertman, 2011), and they have been recommended to be planted around hospitals for specific ailments (Beresford-Kroeger, 2019).

6. CONCLUSIONS

This study has created foreknowledge about FB as a medicine among HPs in Rivers State, and can increase awareness of FB as expressed by participants' willingness to acquire more and share the knowledge. Age and years of experience were positive predictors for acquiring and sharing knowledge, respectively. However, their willingness to prescribe FB is highly gender sensitive towards female HPs more likely to prescribe than male counterparts. In details, profession, years of practice, income, and age were positive predictors for female. And for male, only years of practice was found as positive predictor. Urgent collaborative researches are needed to specifically test healing effect of some specific forest types or trees. Future conferences and seminars in Nigeria are important featuring professional experts.

CONFLICTS OF INTEREST

All authors declare no conflict of interest.

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AUTHOR CONTRIBUTIONS

AAA, GAA - Research concept and design; GAA, TOE, IOD, WUO, ACE - Collection and/or assembly of data; WUO, ACE - Data analysis and interpretation; GAA, IOD - Writing the article; AAA, TOE - Critical revision of the article; All authors approved the final version of article.

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