Community Pharmacy - Based Immunization in Bayelsa State, Nigeria: Prevalence, Patterns and Logistics

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ABSTRACT

Immunization is a global health and development success story, saving millions of lives every year. There are now vaccines to prevent more than 20 life threatening diseases helping people of all ages live longer , healthier lives. . There is currently vaccine underutilization globally especially in Africa prompting a need to increase the number of immunization providers and the number of sites where patients can receive immunizations. This study sought to assess the correlates of Community Pharmacy-Based Immunization (CPBI) practices in terms of prevalence of practice and patterns, and availability of logistics for smooth delivery in Bayelsa State, Nigeria.

A total of 67 randomly - selected Community Pharmacists (CPs) were surveyed, whereby data was obtained with an appropriately designed, pre-tested and validated self-administered questionnaire. The collected data was analyzed with the IBM Statistical Package for Social Sciences (SPSS) version 25

Some of key findings of this study include the revelation that just slightly above half (52%) of the respondents, a modest proportion of the studied CPs, were involved in some forms of vaccination practices and were mainly involved with adult, paediatric and routine immunization . In addition, majority (59.70%) "Always" or "Sometimes" administered the vaccines themselves while 25.37% of the respondents "Always networked" with the Government (Ministry of Heath/Health Management Board) to provide immunization services; 40.3% "Sometimes networked" with other community pharmacists to provide immunization services; whereas 31.34% "Sometimes networked" with Non - Governmental Agencies such as world health organization (WHO), united nations international education fund (UNICEF) etc to provide immunization services. Furthermore, 80.60% of the respondents were never involved in the training and supervision of community health workers on the proper handling, usage and administration of vaccines and 82.09% were never involved in public health education and enlightenment programmes on vaccination.. About 43.28% of respondents sometimes handled Rotavirus vaccine.

About 59.70% of the respondents "Sometimes" had Adequate or Regular supplies of vaccines; only 8.96% "Always" had adequate or Regular supplies and 31.34% "Never" had Adequate or Regular supplies. Although quite a few number of the respondents always had Electric Refrigerators (49.25%), Gasoline Deep Freezers (23.88%) and Vaccine Vial Monitor (VVM) (23.88%); most of them did not have the listed cold chain storage equipment. Nevertheless, about a third (31.34%) of the respondents claimed to "Always" maintain and 46.27% reported to "Sometimes" maintain the cold chain at all times. Worth noting, majority of the respondents **(**67.1%) never kept a register of clients and almost half (49.25%) never documented all Adverse Effects Following Immunization (AEFI). The most frequently encountered AEFI were Pain at injection site (34.33%), Redness or swollen at site of the injection (34.33%) and Fatigue (16.42%). .There is a strong need to improve on the present level of involvement of CPs in Bayelsa State with CPBI in order to tap into the resultant benefits of the practice.It is also very important for the CPs to always keep registers for clients and appropriately document all AEFIs.

Key words: Community Pharmacy Based Immunization; Cold Chain; Pharmacovigilance; Adverse Events Following Immunization.

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BACKGROUND

Vaccination is deemed to be one of the safest, most efficient and cost-effective means of preventing, controlling and eradicating deadly infectious diseases which are leading causes of morbidity and mortality worldwide; nevertheless vaccine-preventable diseases (VPD) continue to ravage and decimate the lives of people globally. (Ozawa et al., 2017; WHO, 2017; Frenkel, 2021; Ang et al., 2022).

The World Health Organization (WHO) estimates that vaccinations save the lives of 2-3 million people each year, and increased vaccination coverage could annually prevent an additional 1.5 million premature deaths globally (WHO, 2017).

Recent estimates put under-5 mortality rate at 107 per 1000 live births (World Bank, 2022).

Further, it is reported that vaccine preventable deaths comprise about 20% of childhood deaths (Frenkel, 2021; World Bank, 2022; WHO, 2024).

Community pharmacies have long been recognized as the most accessible health care settings due to the large number of people who use their services (Jackson et al., 2004). To this end, community pharmacists are strategically positioned to help improve and promote health, educate patients about their diseases in addition to other essential services relating to health maintenance in collaboration with other health care providers (Nkansah et al., 2010)..

Literature findings have also demonstrated that the pharmacists' involvement as immunizers or advocators or both significantly increased the immunization uptake,[Le et al., 2003]

Additionally, published medical literature suggests that pharmacies are uniquely positioned to influence previously difficult-to-reach populations (Crawford et al., 2011;Westrick, 2010). and that pharmacies can effectively reach high-risk, older adults who often require their services (Francis and Hinchliffe, 2011).

It has long been expressly noted in literature that pharmacy has a history of facilitating self-care and recently pharmacists and their staffs were being provided opportunities to expand their contributions which include involvement in routine immunization (Rutter, (2015).

Routine immunization has been reported to be capable of preventing the annual death of over 40,000 to 50,000 adults and children in Nigeria if it was successfully available (Abdhuraheem et al., 2011).

Paradoxically, the underutilization of the widely available vaccines has created an opportunity for pharmacists to play a role in improving immunization rates and thus advancing public health. Therefore, community pharmacy-based vaccination services will go a long way in increasing the number of immunization providers and the number of sites where patients can receive immunizations. It was thus our focus in this study and main objective was to investigate with the aim to understand the current role of community pharmacy-based immunization (CPBI) in Bayelsa state as well as to assess the correlates of immunization practices in community pharmacies.

The specific objectives for the study were to determine:

- Prevalence, patterns of immunization and types of Vaccination Practices
- Types of Vaccines handled; their adequacy, availability and regularity of supply
- Availability of Storage and Cold Chain Facilities
- Pharmacovigilance and Documentation Practices, and
- Prevalence of Adverse Events Following Immunization (AEFI)

The following research questions were formulated for the study:

- What is the prevalence, pattern of immunization practices and vaccination practices available in community pharmacies (CPs) in Yenagoa local government area in Bayelsa state?

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- What are the types of vaccines being used and what is their level of availability?
- What is the level of availability of vaccine storage, distribution and cold-chain facilities in CPs?
- What is the level of involvement with Pharmacovigilance practices and documentation practices related to immunization practices in CPs?
- What are the commonly encountered Adverse Events Following Immunization?

METHODOLOGY

The study design adopted for this study was descriptive cross-sectional chosen due to its ability to study subjects/participants in their natural environment/settings such as their workplaces, and to collect data on multiple explanatory variables and outcome variables, simultaneously, at that particular point in time, using only a cross-section of the population. The target population for this study were CPs working in community

pharmacies in Yenagoa local government area of Bayelsa state, in Nigeria. A convenient, simple random sampling method was used for the study.

The inclusion criteria for the study included only registered community pharmacies and CPs working in community pharmacies in Yenagoa local Government Area (YELGA) of Bayelsa State, who were accessible and available during the study period and who consented to participate in the study. All non-registered community pharmacies, CPs not available/accessible during the study and who did not consent to participate in the study were excluded from participating in this study.

To collect the required data, a semi-structured pre-tested questionnaire was self-administered to 67 Community Pharmacists after establishing its reliability and validity. The Cronbach Alpha Correlation test was used for establishing the reliability of the questionnaire items whereby a reliability index of 0.87 was obtained which fell within the acceptable range .

For ethical reasons, the aim and objectives of the study, any benefits, potential risks of participating in the study, if at all, rights of the participants, how they will be resected/and/or guaranteed, confidentiality, anonymity and security of the information they will give, were adequately explained to each of the respondents. Subsequently,

informed consent was duly sought and obtained from the study participants verbally and checking/ticking a Box on the Informed Consent cover letter as an indication of consent. To conduct the study an ethical approval for the study was obtained from the Ethics Committee of the State Ministry of Health (ECSMH). Anonymity and confidentiality of information generated from the respondents including academic integrity were equally maintained throughout the study period.

The returned questionnaires were labeled with unique numbers, which was their only identifier. The required information/data was extracted from the questionnaires, organized in tabular format, processed appropriately for the subsequent statistical analysis. The processed data was carefully analyzed using the IBM Statistical Package for Social Sciences (SPSS) version 25 and subjected to both descriptive statistics for means, standard deviations and inferential statistics for hypothesis testing in terms of the one sample t-test to determine if the mean calculated from the sampled CPs data for a single variable was similar or different, equal or not equal from that of the Target Population from which they were sampled and/or a designated/hypothesized or estimated mean value by the researcher. Pre-stated null hypothesis for each of the three test variables "Availability of Vaccinations", "Frequency of the Availability of Storage/Cold Chain facilities" and "Pharmacovigilance and Documentation Practices", to the effect that "The Sample and Population Mean Difference" is equal to the estimated /hypothesized value, e.g. "0" (Xbar – μ = 0, or Xbar = H_O), at 95% confidence level and significance level alpha = 0.05), Or, "The Samples Do Not Come from the same Population, Or "The Study/Sample Population of the Studied CPs is Different from the Target Population or the Wider Population of CPs", were formulated and tested with the one sample t-test. The Statistical significance (P value or the alpha), mean difference and the "T" value were used to interpret the results and make decision on the restated null hypothesis. A P- value of less than the pre-stated alpha ($P < 0.05$), was used

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to judge statistically significant differences. The results of the analysis were summarized and presented in the form of summary frequency tables, statistical summaries and bar charts.

RESULTS

Demographic Characteristics of Respondents

A 100% response rate was achieved in this study, which allowed further analysis of the data and making of valid conclusions from the results of the analysis.

There were more males (76.12%) in the study with majority (46.27%) in the age bracket 31-40 years; 19.40% were aged 50 and above; 17.91% and 16.41% were in the 21-30 and 41-50 age bracket, respectively. About three-quarters of the respondents (74.63%) were married, over 80% were Christian (83.58%) and only 16.42% were Muslims. Additionally, about three-quarter of the respondents were schooled up to first degree level (73.13%) and 11.94% had Master's degree. While majority (64.18%) were of Ijaw extraction; Igbos constituted 26.87% and Yorubas 8.96%.

Proportion of respondents providing immunization services

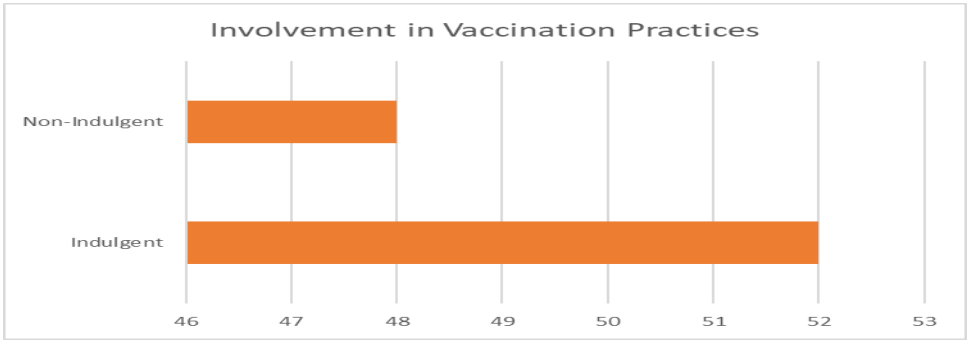

Figure 1: Proportion of respondents providing immunization services

Figure 1 summarizes the proportion of CPs providing immunization services. The data revealed that 52% of the respondents were involved in some forms of vaccination practices.

Categories of Immunization Practices Undertaken by CPs

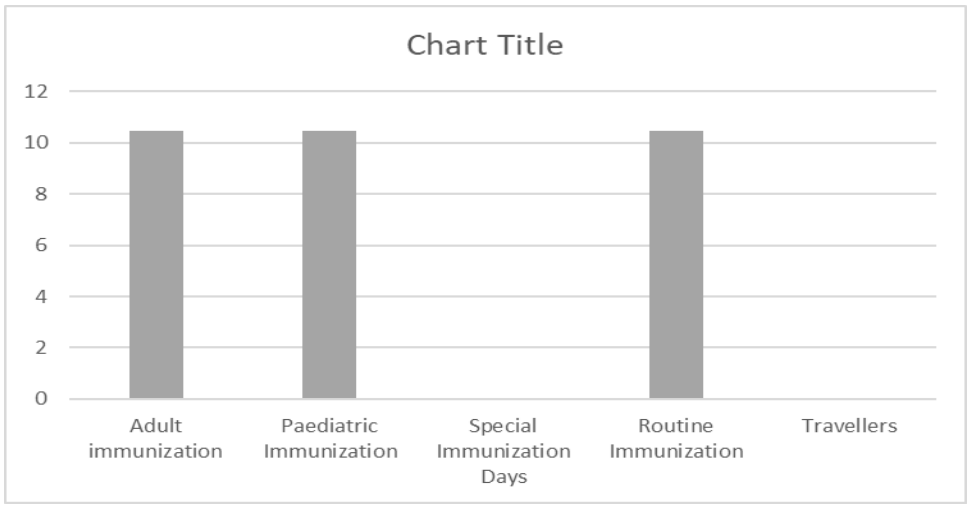

Figure 2. Categories of Immunization Practices undertaken by CPs

Figure 2 summarizes the categories of the immunization practices by the CPs. The data of the figure revealed that respondents were mainly involved with Adult, Paediatric and Routine Immunization with Zero involvement with Special Immunization Days and Travelers' Immunization.

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Frequency of Actual Involvement in Vaccination Practices and Programmes by respondents

Table 1. Frequency of Actual Involvement In Vaccination Practices b y Respondents

Vaccination Practices and Other Correlates	Always		Sometimes		Never	
	Freq	%	Freq	%	Freq	%
Do you administer the vaccines yourself?	7	10.45	33	49.25	27	40.30
Do you network with other community pharmacies to provide immunization services?	1	1.49	27	40.30	39	58.21
Do you network with the Government (Min of Heath/HMB) to provide immunization services?	17	25.37	0	0.00	50	74.63
Do you network with non - governmental agencies (WHO, UNICEF etc.) to provide immunization services?	0	0.00	21	31.34	46	68.66
Do you network with the Community where you are situated to provide immunization services?	6	8.96	20	29.85	41	61.19
Are you involved in the training and supervision of community health workers on the proper handling, usage and administration of vaccines?	0	0.00	13	19.40	54	80.60
Are you involved in public health education and enlightenment programmes on vaccination?	0	0.00	12	17.91	55	82.09
Average	**4**	**6.61**	**18**	**26.87**	**45**	**66.52**

Table 1 is a summary of the frequency of the actual provision of immunization by the CPs. According to the Table, majority (59.70%) Always or Sometimes administered the vaccines themselves; 25.37% Always networked with the Government (Ministry of Heath/Health Management Board) to provide immunization services; 40.3% Sometimes networked with other community pharmacists to provide immunization services; 31.34% Sometimes networked with Non – Governmental Agencies (WHO, UNICEF etc) to provide immunization services; 80.60% were never involved in the training and supervision of community health workers on the proper handling, usage and administration of vaccines; 82.09% were never involved in public health education and enlightenment programmes on vaccination.

Types of Vaccines administered / retailed by CPs

Table 2. Types of Vaccines Administered/retailed by Respondents

Types and Frequency of Use of Vaccines for the Immunization Practices	Always		Sometimes		Never	
	Freq	%	Freq	%	Freq	%
Oral polio	6	8.96	16	23.88	45	67.16
Measles	1	1.49	21	31.34	45	67.16
BCG	0	0.00	21	31.34	46	68.66

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Hepatitis A & B	5	7.46	17	25.37	45	67.16
Pneumococcal Conjugate Vaccine	0	0.00	22	32.84	45	67.16
Pentavalent vaccine	0	0.00	22	32.84	45	67.16
Meningococcal conjugate	0	0.00	21	31.34	46	68.66
Mumps	5	7.46	16	23.88	46	68.66
Rotavirus	5	7.46	29	43.28	33	49.25
Rubella	5	7.46	23	34.33	39	58.21
Yellow fever	0	0.00	21	31.34	46	68.66
Tetanus	6	8.96	21	31.34	40	59.70
Haemophilus Influenza	0	0.00	22	32.84	45	67.16
Vitamin A	0	0.00	22	32.84	45	67.16
Chicken pox	0	0.00	21	31.34	46	68.66
MMR	0	0.00	21	31.34	46	68.66
Typhoid	0	0.00	22	32.84	45	67.16
DPT	5	7.46	17	25.37	45	67.16
HPV	0	0.00	22	32.84	45	67.16
Tdap	5	7.46	16	23.88	46	68.66
Varicella	5	7.46	17	25.37	45	67.16
Q fever	0	0.00	21	31.34	46	68.66
Covid-19	0	0.00	22	32.84	45	67.16
Average	**2**	**3.11**	**21**	**30.69**	**44**	**66.19**

Table 2 is a summary of the vaccines retailed and administered by the CPs. According to the Table, about 43.28% of respondents sometimes handled Rotavirus vaccine; whereas about a third Sometimes handled Measles, BCG, PCV, Pentavalent vaccine, Meningococcal conjugate, Rubella, Yellow fever, Tetanus, Hemophilus influenza, Chicken pox, MMR, Typhoid, Q fever and.Covid-19. vaccines. Less than 10% always dealt with Oral polio, Measles, Hepatitis A & B, Rotavirus, Mumps, Rubella, Tetanus, Tdap, and Varicella Well over half and close to 70% respondents never handled listed vaccines. Table 2.

Availability And Management Of Vaccines

Adequacy and Regularity of Vaccines Supply

Table 3: Adequacy and Regularity of Vaccines Supply

Vaccine Adequacy and Regularity	Always		Sometimes		Never	
	Freq	%	Freq	%	Freq	%
Do you have adequate supplies of Vaccines in your premises?	6	8.96	40	59.70	21	31.34
Do you have regular supplies of Vaccines in your premises?	6	8.96	40	59.70	21	31.34

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Table 3 summarizes information about the adequacy and regularity of the vaccine supply. According to the Table, about 59.70% of respondents Sometimes had Adequate or Regular supplies of vaccines; only 8.96% Always had adequate or Regular supplies and 31.34% Never had Adequate or Regular supplies. Table 3.

Frequency of Availability of Vaccines in Community Pharmacies

Table 4. Frequency of Availability of Specific Vaccines in Community Pharmacies

Frequency of availability of vaccines	Always		Sometimes		Never	
	Freq	%	Freq	%	Freq	%
Oral polio	21	31.34	1	1.49	45	67.16
Measles	5	7.46	16	23.88	46	68.66
BCG	5	7.46	8	11.94	54	80.60
Hepatitis A & B	5	7.46	8	11.94	54	80.60
Pneumococcal Conjugate Vaccine	0	0.00	13	19.40	54	80.60
Pentavalent vaccine	0	0.00	14	20.90	53	79.10
Meningococcal conjugate	0	0.00	13	19.40	54	80.60
Mumps	0	0.00	8	11.94	59	88.06
Rotavirus	5	7.46	8	11.94	54	80.60
Rubella	13	19.40	9	13.43	45	67.16
Yellow fever	11	16.42	17	25.37	39	58.21
Tetanus	33	49.25	1	1.49	33	49.25
Haemophilus Influenza	16	23.88	1	1.49	50	74.63
Vitamin A	8	11.94	8	11.94	51	76.12
Chicken pox	8	11.94	14	20.90	45	67.16
MMR	8	11.94	14	20.90	45	67.16
Typhoid	0	0.00	13	19.40	54	80.60
DPT	0	0.00	13	19.40	54	80.60
HPV	5	7.46	9	13.43	53	79.10
Tdap	0	0.00	0	0.00	67	100.00
Varicella	0	0.00	5	7.46	62	92.54
Q fever	0	0.00	6	8.96	61	91.04
Covid-19	0	0.00	6	8.96	61	91.04
Average	**6**	**9.28**	**9**	**13.30**	**52**	**77.42**

Table 4 shows the frequency of the availability of specific vaccines in the community pharmacies studied . According to this Table, the respondents reported to have “Always” regular stocks of Tetanus toxoid (49.25%), Oral Polio (31.34%), Haemophilus Influenza (23.88%), Rubella (16.42%, Yellow fever (16.42%) in that order.

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About a fifth of the respondents reported to "Sometimes" have stocked for the following vaccines Measles, Pentavalent, Yellow Fever, Chicken pox, MMR, Typhoid and DPT vaccines; majority (over half) of respondents NEVER stocked listed vaccines.

Results of the One Sample T-Test for Availability of Vaccines

Table 5: results of the One Sample T-Test for Availability of Vaccines

One sample t-test of availability of vaccines in community pharmacies								
Mean	Std dev	Min	Max	Sig.	T	Df	md	95%CI
22.581	11.615	0.000	50.740	< 0.0001,	9.324	22	22.581	17.559 to 27.604

Table 5 summarizes the results of the one sample t-test for the test variable "availability of vaccines in the community pharmacies". According to the table there was a statistically significant difference between the mean of the sample from the hypothesized mean value as indicated by the Sig. (P<0.0001), T value (9.32) and mean difference (md) = 22.56. Hence, the null hypothesis that "The Sample and Population Mean Difference was not equal the Hypothesized Value e.g. "0", or The Sample Mean was Not equal to that of the Target Population from which it was

sampled", is rejected. And Conclusion to the effect that the Sample came from the Target Population, the availability of vaccine in the sampled community pharmacies were was different from the availability of the same in Community Pharmacies in general, thus similar is made. From the Table and from the sampled data, it can be concluded the true population mean value for the availability of vaccines in the CPs is most likely to fall between the 17.56 to 27.6 (95%) confidence interval range.

Frequency of Availability of Storage/Cold Chain Facilities

Table 6: Frequency of Availability of Storage/Cold Chain Facilities

Cold Chain Facilities	Always		Sometimes		Never	
	Freq	%	Freq	%	Freq	%
Electric Deep Freezer	7	10.45	21	31.34	39	58.21
Solar Deep Freezer	0	0.00	6	8.96	61	91.04
Gasoline Deep freezer	16	23.88	6	8.96	45	67.16
Electric Refrigerator	33	49.25	28	41.79	6	8.96
Solar Refrigerator	0	0.00	1	1.49	66	98.51
Gasoline Refrigerator	0	0.00	0	0.00	67	100.00
Ice - making machine	6	8.96	6	8.96	55	82.09
Gel packs	20	29.85	9	13.43	38	56.72
Cold boxes	14	20.90	15	22.39	38	56.72
Vaccine carriers	14	20.90	21	31.34	32	47.76
Insulated Boxes	0	0.00	13	19.40	54	80.60
Dial Thermometers for Cold Chain network	1	1.49	6	8.96	60	89.55
Ordinary Thermometers	7	10.45	28	41.79	32	47.76

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VVM	16	23.88	12	17.91	39	58.21
Do you maintain the Cold Chain at all times?	21	31.34	31	46.27	15	22.39
Do you operate an Active cold chain packaging system?	5	7.46	35	52.24	27	40.30
Do you operate a Passive cold chain packaging system?	12	17.91	28	41.79	27	40.30
Average	**10**	**15.10**	**16**	**23.35**	**41**	**61.55**

The Tables 6 is a summary of the frequency of availability of storage/Cold chain facilities in the studied community pharmacies and the results of one sample t-test for the same. According the Table respondents ALWAYS had Electric Refrigerators (49.25%) and Gasoline Deep Freezers (23.88%) and VVM (23.88%); Sometimes had Electric refrigerators (41.79%), Electric Deep Freezers (31.34%), Ordinary Thermometers (41.79); most respondents did not have the listed cold chain storage equipment. Nevertheless, about a third (31.34%) claimed to always maintained and 46.27% to Sometimes maintained the cold chain at all times; 52.24% reported to Sometimes operated an Active cold chain packaging system and 41.79% operated a Passive cold chain packaging system as shown in . Table 6.

Table 7: One Sample t-test For the Availability of Storage/Cold Chain Facility

One sample t-test of availability of storage/cold chain facilities in community pharmacies								
Mean	Std dev	Min	Max	Sig.	T	Df	Md	95%CI
38.455	26.179	0.000	91.040	< 0.0001	6.057	16	38.455	24.995 to 51.916

Pharmacovigilance And Documentation Practices

Table 8: Pharmacovigilance And Documentation Practices

Pharmacovigilance / Documentation	Always		Sometimes		Never	
	Freq	%	Freq	%	Freq	%
Keeping a Register of Clients.	12	17.91	10	14.93	45	67.16
Document all AEFI	21	31.34	13	19.40	33	49.25
Reporting AEFI to NAFDAC.	16	23.88	6	8.96	45	67.16
Discontinue vaccination as a result of AEFI.	6	8.96	11	16.42	50	74.63
Counselling clients or care-givers on possible adverse effects and what to do if they occur.	44	65.67	17	25.37	6	8.96
Average	20	29.55	11	17.01	36	53.43

Table 9: One Sample t-test for Pharmacovigilance and Documentation

One sample t-test level of involvement in Pharmacovigilance and documentation practices of community pharmacies								
Mean	Std dev	Min	Max	Sig.	T	Df	Md	95%CI
46.567	23.753	25.380	91.040	0.0049	4.802	5	46.567	21.635 to 71.498

Table 8 summarizes the information on Pharmacovigilance and Documentation practices of the studied CPs and Table 9 the results of one sample t-test for the same. According to the Table, majority of respondents (67.1%) NEVER kept a register of Clients; and about half (49.25%) NEVER documented all Adverse Effects Following Immunization (AEFI); 67.16% NEVER Reported Adverse events to NAFDAC; 74.63% NEVER

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had reasons to discontinue vaccination as a result of Adverse effects; about a third (31.34%) ALWAYS documented AEFI and 23.88% ALWAYS reported Adverse events to NAFDAC; 65.67% ALWAYS counseled clients or care-givers on possible adverse effects and what to do if they occurred.

Frequency and Types of Adverse Events Following Immunization [AEFI]

Table 10: Frequency and Type of Adverse Effects Following Immunization [AEFI]

	Always		Sometimes		Never	
	Freq	%	Freq	%	Freq	%
Pain at injection sites.	23	34.33	44	65.67	0	0.00
Redness or swollen at site of the injection .	23	34.33	44	65.67	0	0.00
Fever .	5	7.46	51	76.12	11	16.42
Headache.	5	7.46	45	67.16	17	25.37
Body ache.	5	7.46	52	77.61	10	14.93
Muscle and joint ache.	5	7.46	45	67.16	17	25.37
Fainting or dizziness.	5	7.46	12	17.91	50	74.63
Serious allergic reaction (anaphylaxis)	5	7.46	18	26.87	44	65.67
Fatigue.	11	16.42	40	59.70	16	23.88
	10	14.43	39	58.21	18	27.36

Table 10 is a summary of the frequency and type of adverse effect following immunization. According to the table, the most frequently encountered AEFI were Pain at injection site (34.33%), Redness or swollen at site of the injection (34.33%) and Fatigue (16.42%); those there were Sometimes seen were Body ache (77.61%), Fever (76.12%), Headache (67.16%), Muscle and joint ache (67.16%), Pain at Injection site (65.67%) and Redness or swollen at site of the injection (65.67%); majority reported Never encountered Fainting or dizziness. (74.63%) and Serious allergic reactions (anaphylaxis) (65.67%).

DISCUSSION

What is very obvious and clear from these data is the fact that the CPs across board had the basic qualification to be registered as Pharmacists. In Nigeria. As at today, the basic requirement for registration as a pharmacist is the Bachelor of Pharmacy degree (BPharm. Degree). This will soon change to PharmD (PCN, 2024).

Community Pharmacy-Based Immunization Services (Cpbis)

This study revealed that a little over a half (52%) of CPs indulged in some forms of vaccination practices as shown in Figure 1. This is discordant with the 97% reported in a similar study in Calabar Metropolis, Nigeria (Agbo et al., 2019) and another study in the UK that reported that 92% (Perman *et al.*, 2018). These disparities could be due to differing study designs, methodology used, target population, sample size etc.

CPs in Bayelsa state should be mobilized and encouraged to provide vaccination services as a routine practice for maximal impact.

Furthermore,our study revealed that respondents were mainly involved with Adult, Paediatric and Routine Immunization with Zero involvement with Special Immunization Days and Travelers' Immunization as indicated in Figure 2. Ideally, every aspect of vaccination should be covered as opined by a study (Alabi et al., 2024). Hence, it is very concerning that CPs in Bayelsa state do not participate in special immunization days.

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Regarding details of actual Involvement in Vaccination Practices and services by CPs**,** slightly more than half (59.70%) of CPs Always or Sometimes administered the vaccines themselves. Perhaps the lack of adequate skill to administer vaccines may be responsible for this rather poor outing. For maximum and effective participation with a resultant significant enhancement of vaccine uptake, all CPs should be trained and motivated to administer vaccines directly to clients.

Data from this study further showed that only about one-quarter (25.37%) of CPs Always networked with the Government (Ministry of Heath/Health Management Board) to provide immunization services; less than a half (40.3%) Sometimes networked with other CPs to provide immunization services; about a third (31.34%) Sometimes networked with Non - Governmental Agencies (WHO, UNICEF etc) to provide immunization services. As such ,there is much room for improvement in their practice of networking with relevant stakeholders. It is advocated that an effective collaboration with the public (government and health departments) and private (various pharmacy chains) sectors will contribute significantly to the success of CPBIS. Therefore, CPs should network among themselves, other health practitioners , government and appropriate non-governmental agencies to plan and provide immunization services to the communities they serve.

It is concerning that a large majority (80.60%) were never involved in the training and supervision of community health workers on the proper handling, usage and administration of vaccines and also a huge proportion (82.09%) were never involved in public health education and enlightenment programmes on vaccination. These services are well within the competencies of the pharmacist to effectively provide. (Awosika, 2012). Government and appropriate stakeholders and managers are encouraged to take advantage of this fact.

Regarding Vaccines administered/retailed by CPs, less than half **(**43.28%) of sometimes handled Rotavirus vaccine. Only about a third Sometimes administered Measles, BCG, PCV, Pentavalent vaccine, Meningococcal conjugate, Rubella, Yellow fever, Tetanus, Haemophilus influenza, Chicken pox, MMR, Typhoid, Q fever and Covid-19 with less than 10% always dealing with Oral polio, Measles, Hepatitis A & B, Rotavirus, Mumps, Rubella, Tetanus, Tdap, and Varicella vaccines. Discouragingly and appallingly, well over half and close to 70% of CPs never handled listed vaccines. This level of involvement of CPs in Bayelsa state is grossly below expectation in showing the involvement in this crucial public health activity. If pharmacists must be seen to be public health professionals, then this is an area for them to prove their worth. Strategic education and enlightenment may likely improve their performance in this area. It is not unlikely too that certain barriers and challenges like availability of vaccines and storage facilities may be responsible for this limited involvement.

Currently there is a vaccine under-vaccination dilemma especially in Africa. Both national and sub-national immunization coverage rates have been reported to stagnate in many countries, and the African region is said to still lag behind other regions of the world regarding access to vaccines with approximately 1 in 5 African children not receiving all the necessary and basic vaccines. The consequence of this is that more than 30 million children under five still suffer from vaccine-preventable diseases (VPDs) every year in Africa. Of these, over half a million children die from VPDs annually – representing approximately 58% of global VPD-related deaths (WHO,2018).

It is thus worrisome that there is established a heavy global burden of vaccine-preventable infectious diseases in children less than 5 years of age (Frenkel, 2021; Hannah Ritchie,2024; Galadima et al., 2021; WHO / UNICEF, 2014; Yeung et al., 2017; Galles et al., 2021).

It is reported that despite the gains and cost-effectiveness of vaccination in preventing childhood morbidity and mortality (UNICEF, 2018; Zhou et al., 2014; Awosika, 2012; WHO, 2018), childhood vaccination coverage (putting into consideration infants that have received all the recommended doses by the time they are age 12 months and above) in Nigeria remains abysmally low.

Further, it was reported that in the year 2018, Nigeria alone accounted for more than one-quarter of the global unvaccinated children (WHO, 2020). The Monitoring and Evaluation/Accountability Framework]. Similarly,

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as of 2018, less than one-quarter of children 0-11 months were fully immunized (NPC and ICF International, 2019).

Recent statistics also further revealed that the national coverage for full vaccination (all first-year antigens) among children 12-23 months in Nigeria is 35.6%, with sharp regional variation. The highest coverage in the northern region was reported in the north-central at 32.4%, while the highest coverage in the south was reported in the southeast at 57.3% (NBS and UNICEF, 2022). All these coverages are far below the Global Vaccine Action Plan (GVAP) target of at least 90% (Brown, 2018; Alabi et al., 2024).

If this ugly trend must be reversed, CPs must fully embrace CPBI practices in order to significantly augment vaccine uptake especially in Nigeria.

For now, data from this study regarding prevalence, patterns and vaccination offerings through CPBIS fall short of basic requirements and expectations which might be contributing to under-vaccination, a huge immunization delivery gap and a high prevalence of VPDs.

As opined globally, alternative approaches to immunization delivery may help address the under-vaccination dilemma and the strategy to address these persistent shortfalls and barriers is to leverage non-traditional sites of vaccination delivery. (Jackson et al., 2004; Nkansah et al., 2010; Bodenheimer, 2006; CDC and P, 2000)

Thus, the way forward towards expansion of immunization coverage is to increase the staff available for the job and to increase the number of immunization centres.

In other words, the continuously growing need for immunization requires adequate human and material resources.

To this end, integrating pharmacists into immunization efforts was considered the most readily available option.

In a health system like ours in Nigeria where shortage of manpower is a major challenge in meeting the health needs of the populace, CPs could significantly bridge this gap especially by providing various types of immunization services to the public even though they are traditionally involved with the sales, storage and distribution of vaccines (Soyemi & Hunponu-Wusu, 2014). It is widely acclaimed that their practice setting provides prime opportunity for them to act as immunization advocates through provision of relevant information and advice about immunization. Other roles may include; vaccine administration, facilitation and referrals (Bach & Goad, 2015).

Furthermore, community pharmacies and other private health care facilities could be useful resources that can complement the efforts of National Primary Health Care Development Agency (NPHCDA) to improve immunization access to the populace.

There is currently no official restriction in Nigeria limiting community pharmacists from providing immunization services to the public (Agbo et al., 2019). NPHCDA that oversees the delivery of immunization services to the public in Nigeria encourages participation of private sector in providing immunization services. NPHCDA provide free vaccines and necessary supportive logistics to private health care providers such as CPs that are interested in immunization services (NPHCDA, 2009). The support provided by NPHCDA should sufficiently serve as motivation for CPs to participate more in immunization services

The underutilization of these widely available vaccines has created an opportunity for pharmacists to play a role in improving immunization rates and thus advancing public health. Community pharmacy-based vaccination services will go a long way to increasing the number of immunization providers and the number of sites.

Numerous studies have consistently demonstrated the effectiveness of integrating pharmacists into immunization campaigns, with a particular focus on expanding access (Awosika, 2012; Strand et al., 2020;

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Skoy et al., 2020; Al-Mahasis et al., 2023; Ezeala et al., 2024; Crunenberg et al., 2023; Tadele et al., 2023; Popovian et al., 2022; Alkhudaidi et al., 2024).

What sets aside the Community Pharmacy for this crucial assignment includes community-centric nature of pharmacies; the approachable nature of pharmacists, the convenience offered by pharmacy locations **(**Alsabbagh et al., 2018; Tadele et al., 2023); professionals that are (or can easily be) trained to handle vaccination activities, including the required logistics and public management tasks, such as appointments scheduling (Romero-Mancilla et al., 2023).

From the foregoing therefore, no doubt, PBIS can provide a significant vaccination volume. With an estimated 250 outlets , community pharmacies have the potential to dramatically increase vaccination rates in Bayelsa state. As at today, however, community pharmacies are underutilized as a site of delivery of vaccinations from the outcome of this study.

Albeit, it is gratifying to note that CPs in Yenagoa LGA have shown interest in CPBIS. But with a huge immunization delivery gap, CPs in YELGA should begin to explore ways of bridging this gap. More CP if not all, should key into CPBIS especially Routine Immunization, storage and distribution of vaccines, the training and supervision of community health workers on the proper handling, usage and administration of vaccines; public health education and enlightenment programmes on vaccination. CPs should also adopt the need for collaboration between other pharmacists and different healthcare vendors to optimize the benefits of these offerings (Wehbi et al.,2019). The collaboration between the public (government and health departments) and private (various pharmacy chains) sectors contributes to the success of CPBI.

The ultimate target should be to ensure full coverage with Routine Immunization which has been shown to play a key role to significantly reduce child mortality due to vaccine preventable diseases (WHO, 2020).

Availability And Management Of Vaccines

Apart from availability of human resources, the other essential requirements for adequate vaccination uptake are the vaccines themselves and the logistics for their distribution and administration. Critical in this respect is the maintenance of the potency of vaccines right through from the manufacturers / distributors until their administration to the client. For the latter to be achieved requires an adequate and effective cold-chain network (PHAC, 2007).

The Cold Chain **r**efers to maintaining potency and integrity of a vaccine by ensuring optimal conditions during storage, handling and transport.

This process includes stakeholders, equipment, and facilities from manufacture to administration and is designed to ensure that proper storage temperatures and protection from light is maintained at every step (PHAC, 2007).

Regarding Adequacy and Regularity of Vaccines Supply, only about one-tenth (8.96%) of respondents reported having adequate or Regular supplies all of the time; about a third (31.34%) reported Never having Adequate or Regular supplies and a little above half (59.70%) of respondents reported having Adequate or Regular supplies of vaccines only sometimes. This is indicated in Table 3.

Data revealed that vaccines that were Always available were Tetanus toxoid (49.25%), Oral Polio (31.34%), Haemophilus Influenza (23.88%); about a fifth of respondents Sometimes stocked Measles, Pentavalent, Yellow Fever, Chicken pox, MMR, Typhoid and DPT vaccines; majority (over half) of respondents NEVER stocked listed vaccines. On average, 77.42% of respondents Never stocked the listed vaccines; only about 10% Always stocked the listed vaccines.

This epileptic nature of vaccine availability does not augur well for adequate vaccines uptake and effective immunization coverage. Adequate networking may be required to solve part of this problem

Frequency of Availability of Storage/Cold Chain Facilities

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Regarding availability of Storage and Cold Chain facilities, about half (49.25%) respondents in this study reported always having Electric Refrigerators, whilst only about one-fifth(23.88%) reported always having Gasoline Deep Freezers and VVM. Further, data revealed that respondents only Sometimes had Electric refrigerators (41.79%), Electric Deep Freezers (31.34%), and Ordinary Thermometers (41.79) but most respondents did not have the listed cold chain storage equipment. Nevertheless, about a third (31.34%) claimed to always maintained and 46.27% to sometimes maintained the cold chain at all times. About half of respondents (52.24%) reported to operating an Active cold chain packaging system and 41.79% operated a Passive cold chain packaging system sometimes.

There is much room for improvement with the availability of storage and cold chain facilities.

In a country like Nigeria where electricity or power supply is poor, problems must definitely abound (Okwor et al., 2009). Deliberate strategies must be adopted to avoid exposure of the vaccines to excessive cold, heat, or light which might result in cumulative and irreversible loss of potency. Adequate networking may also be required to solve part of this problem

Pharmacovigilance And Documentation Practices

One of the fall-outs of immunization is the advent of Adverse Effects following Immunization (AEFI) which are expected to be properly documented and adequately communicated to appropriate authorities like NAFDAC in Nigeria.

In our study, data revealed that most respondents **(**67.1%)never kept a register of Clients; and almost half (49.25%) of the respondents never documented all Adverse Effects Following Immunization (AEFI). Also, most respondents (67.16%) never reported Adverse events to NAFDAC but majority (74.63%) reported that they never had reasons to discontinue vaccination as a result of Adverse effects. Only about a third (31.34%) ALWAYS documented AEFI and about one-fifth (23.88%) always reported Adverse events to NAFDAC. But most respondents (65.67%) reported to always counseled clients or care-givers on possible adverse effects and what to do if they occurred as summarized in Table 8.

Frequency and Type of Adverse Events Following Immunization [AEFI]

The most frequently encountered AEFI were Pain at injection site (34.33%), Redness or swelling at site of the injection (34.33%) and Fatigue (16.42%); those that were Sometimes seen were body ache (77.61%), fever (76.12%), headache (67.16%), muscle and joint ache (67.16%), pain at Injection site (65.67%) and redness or swollen site of the injection (65.67%); majority reported never encountered Fainting or dizziness (74.63%) and Serious allergic reactions (anaphylaxis) (65.67%). This information is summarized and presented in Table 10.

It is of absolute necessity to always document all adverse events following immunization. The level of pharmacovigilance among the respondents in this study is rather poor. Deliberate efforts must be made to improve on it. By providing important information for public health planning and potential intervention targets, such as the proportion of CPs currently involved in immunization practices and deficiencies such as lack of pharmacovigilance as evidenced by the substantial respondents who reported not having registers for their clients or documenting the complete AEFIs and in Storage Facilities, this study has increased our current knowledge thus made significant contribution to the field of public health and to the body of knowledge in general.

Limitations To The Study

This cross-sectional design study was carried out only among the registered community pharmacies in YELGA, bayelsa and may not truly represent the entire state. There is, therefore, the need to interpret the results with caution. It is also recommended that further analysis with more advanced statistical techniques like multivariate analysis be done to adjust for confounding factors. Further studies with more robust designs are needed to confirm the observations.

CONCLUSION

This study has considered PBIS in community pharmacies in Yenagoa metropolis in Bayelsa State, Nigeria. This has arisen from the understanding that CPBI has emerged as a critical component of public health efforts, aiming to enhance access to vaccinations and improve overall community well-being.

The study revealed a rather poor level of involvement in CPBI among CPs in Bayelsa State both in terms of direct participation in vaccination services, availability of vaccines, storage and cold-chain facilities and pharmacovigilance as well as documentation practices. Further, data revealed a poor net-working among CPs, other health professionals, government and non-governmental agencies who are directly or indirectly connected with immunization services in Nigeria.

There is therefore a strong need to improve on the present level of involvement of CPs with CPBI in order to tap into the benefits of the latter. It is also very important for the CPs to always keep registers for clients and appropriately document all AEFIs

It is opined that appropriate government policies empowering CPs should be put in place, sensitization on the importance of pharmacovigilance and documentation, as

well as proper training of CPs should follow. The undergraduate pharmacy curriculum should be reviewed to include acquisition of knowledge and skills for providing immunization services.

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