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Capacity Utilization in Pharmaceutical Industry in Nigeria

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Abstract

The performance of any enterprise is influenced by the environment in which it is located. The last two decades has witnessed the pre and post democratic governance in Nigeria as well as a number of government initiatives aimed at addressing some challenges facing the health delivery system of the country. The purpose of this paper was to study the capacity utilization of the pharmaceutical industry in the last twenty years to understand the association or otherwise with some government initiatives. A survey of the scientific work force and the capacity utilization in the industry was carried out. Interviews were held with individual to gain more insight in the activities of the industry during the period. The study showed that the capacity utilization of the pharmaceutical industry increased steadily but marginally. There was reason to believe that the marginal increment in the capacity utilization was influenced by the government policies and initiatives but the local industry is yet to be able to meet substantial essential drug needs of the country. Improvement in the internal controls and management by the industry along with sustained support and provision of infrastructures by the government would help to improve the capacity utilization in the pharmaceutical industry.

Keywords: Government initiatives; Pharmaceutical industry; Performance; Influence

Introduction

Nigeria is a relatively large country with an estimated population of 169 million and it is endowed with natural resources, high levels of human and social capital. However, it is plagued with a very high incidence of disease, poverty and malnutrition and has lower life expectancy than some other African countries of comparable economy (WHO, 2013).

The role of the pharmaceutical industry in a country such as Nigeria in the provision of safe, pure, quality and efficacious products to meet the healthcare need of the populace cannot be over-emphasized. Provision of essential medicines by this sector would curb infiltration of the market with spurious and sub-standard products and would also enhance the economy.

In realization of key role the availability of essential drug plays in health system, the government of Nigeria has made more efforts in empowering the pharmaceutical industry in the last two decades than was ever made in the history of the country (Table 1). Specifically, the Petroleum Trust Fund (PTF) was established by the Federal Government in 1990s to provide infrastructural incentives to all sectors of the economy, as a palliative to the increased pump price of petroleum and the pharmaceutical industry was a key beneficiary (LFN, 1994). The year 1990 witnessed the adoption and launch of the maiden National Drug Policy (NDP) for Nigeria to address theinadequacies in drug availability, supply and distribution. The establishment of National Agency for Food and Drugs Administration and Control, (NAFDAC), the publication of Essential Drug List (EDL) and a National Drug Formulary (NDF) resulted from the policy. In the first revised National Drug Policy (NDP, 2005), it was anticipated that by 2008, the local pharmaceutical industry would have realized a production capacity of 70% to satisfy at least 60% of national drug requirements of essential drugs while the balance was to be exported (NDP,2005). Consequently, a number of essential drugs that the local manufacturing industry has the capacity to produce have been put on import prohibition list to encourage the local manufacture and improve on the capacity utilization of sector (NCS, 2014).

A number of articles are available in the literatures addressing the effect of the various initiatives of the government on the manufacturing sector [1-4] but none regarding the pharmaceutical sub-sector is currently available. Additionally, a typical pharmaceutical industry is home to interdisciplinary professional work force, whose qualifications, motivation and competencies have impact on the quality of products and services rendered by the pharmaceutical industry. The present study was an investigation on the profile of the scientific workforce and the effects of some government initiatives in the last two decades on the capacity utilization of the pharmaceutical industry.

Materials and Methods

The study instruments used were questionnaires and interviews, which contained both closed and open ended questions.

Capacity utilization study

Seventy copies of questionnaires were administered to representatives of the pharmaceutical manufacturing companies. The survey covered Public liability companies (PLC), limited liability companies (LTD) and non-for profit or non-governmental (NGO), which may be a multinational, international or indigenous company. Convenience method of sampling was employed to optimize the results of the survey. The questionnaire was filled by officers who had the relevant information on the following areas:the nature of pharmaceutical business, age of the organization, line of products, annual installed and used equipment capacities, staffing andtheir productivity, number of shifts per day, sources of raw and packaging materials, research and development activities by Nigerian pharmaceutical industry and the use or otherwise of locally fabricated machinery.

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S/N	INITIATIVE	REMARKS
1	National Drug Policy	This was to address drug availability, quality, safety, cost, faking and adulteration, as well as stream line distribution and access.
2	Essential drug list, e.g. 2003 fourth revision, fifth revision in 2010	The fifth review was primarily directed at ensuring that the medicines in the Standard Treatment Guidelines and the Essential Medicines List are harmonized. In addition this review takes care of the new antimalarial drug policy as well as current practices with regards to HIV/AIDS, Tuberculosis/Leprosy treatment policies and other special services. The hope therefore is that this edition will reflect positively on the efforts to make Nigerians healthier at the minimum cost to individuals and governments at all levels. The fifth review and the STG are the products of the hard work put in by the National Drugs Formulary & Essential Drugs Review Committee under the directives of the Foods & Drugs Division of the Federal Ministry of Health and the invaluable contribution of the Country Office of the World Health Organization
3	National formulary	**Prohibition on importation of drugs not in the List, making pharmaceutical industry to concentrate in delivering only essential drugs to the populace. This makes it easier for government to patronize. There is a provision that** a pharmaceutical company or firm or any other body (corporate or unincorporated) may make representation to the Review Committee on any drug or formulation not in the List which it considers to be necessary for essential health care and it shall be expedient for the Review Committee to consider such representation.
4	Establishment of National Agency for Food and Drug Administration and Control	To address drug availability, quality, safety, cost, faking and adulteration, and work to strengthen local industry
5	Import prohibition of some pharmaceutical finished products	**Targeted those drugs that the** local industry has sufficient capacity to manufacture
6	Petroleum Trust Fund- to improve infrastructures	**To improve capacity of the some sectors of the economy including the pharmaceutical industry**
7	The United States President's Emergency Plans for Aids Relief (PEPFAR) Fund	**Local companies to manufacture AIDS/HIV drugs that they have capacity and some are upgrading facilities to meet WHO certification**
8	The public Procurement Act 2007	The Public Procurement Act 2007 established the Bureau of Public Procurement as the regulatory authority responsible for the monitoring and oversight of public procurement, harmonizing the existing government policies and practices by regulating, setting standards and developing the legal framework and professional capacity for public procurement in Nigeria.

Table 1: Some government initiatives aimed at impacting positively on the pharmaceutical industry in Nigeria.

Survey on workforce

Two hundred and fifty (250) copies of the questionnaires were administered to individual employees of the pharmaceutical industry Self-report questionnaires method of Michigan Organization Assessment Package was adapted for the individual questionnaires [5]. The Questionnaire sought information from individual employees working in the pharmaceutical industry in the following areas: age and sex, work experience, job related challenges, meaningfulness of the job, responsibility, variety and skill task identity and feedback, autonomy, work influence, pace control, role conflict and clarity, task uncertainty and interdependence, resource and skill adequacy and competencies. Closed questions were predominantly used, as appropriate, for greater precision and ease of analysis. Various persons including pharmacists, chemists and microbiologists working in sampled pharmaceutical industry received the questionnaires. Engineers and other scientists not directly involved manufacturing and distribution of the pharmaceutical products were excluded from the study. Pre-tested questionnaires were modified to keep the questionnaires short and simple.

Interviews

Interviews were also held with selected individuals who have spent over fifteen years in the industry in strategic positions and understood the dynamics of pharmaceutical business in Nigeria.

Results

Twenty eight organizations comprising nine multinational / international and nineteen indigenous companies responded to the questionnaire. Fourteen (50.0%) and twenty four (85.7%) of the organizations manufacture tablets and liquid preparations respectively. Capsules and sterile products respectively were manufactured in four and three of the facilities surveyed. Twenty two organizations use own facilities for the manufacture of their products while the remaining ones utilized third party facilities.

Installed capacity and capacity utilization

Table 2 shows the one factor analysis of variance (ANOVA) of installed capacity utilization of machinery in liquid and tablet production in the sector over the last twenty years. The capacity utilization in the production of liquid preparations was between 33.08 ± 0.9 - 55.6 ± 1.14% while the corresponding value for the tablets was 35.71 ± 1.8 - 49.93 ± 2.4%. The F (19,460) was 51.14 at P- value of 0.00 compared to the F critical of 1.61 for the liquid production line while in the tablet production line the F (19,260) value was 4.37 compared to F critical of 1.63. Figure 1 shows the capacity utilization in the production of tablets and liquid products. The average capacity utilization decreased in 1995 and 1996. In liquid manufacture, the capacity utilization witnessed marginal increase from 1997 to 2012, and then declined. On the other hand, the capacity utilization in tablets decreased in 2002. Figure 2 shows the combined average capacity utilization of the tablets and liquid preparations. The Figure showed a generally slow but steady rise in the capacity utilization of the period, declining only in 2012.

Infrastructural facilities

Source of energies: Pharmaceutical manufacturers in Nigeria use public and own energy sources. Three (12%) of the respondents use the electricity supply from the Power Holding Company of Nigeria (PHCN), formerly known as National Electric Power Authority (NEPA) while an organization (4%) used own generating plant. Twenty four respondents (96%) depended on PHCN and own plant for energy supply. PHCN electricity supply met 4-64% of the annual energy requirements of the respondent organizations and was considered cheaper than own source of energy.

Water supply: Ninety percent of the respondents have their own water source and do not rely on supply from the public main.

Access road: The pharmaceutical companies have access roads that are not maintained in most of the cases.

SUMMARY

Groups	Count	Sum	Average	Variance
1993	24	857	35.70833	19.08514
1994	24	837	34.875	22.9837
1995	24	794	33.08333	19.9058
1996	24	827	34.45833	26.51993
1997	24	857	35.70833	19.08514
1998	24	857	35.70833	19.08514
1999	24	928	38.66667	32.49275
2000	24	997	41.54167	50.1721
2001	24	1082	45.08333	65.38406
2002	24	1204	50.16667	49.88406
2003	24	1285	53.54167	64.25906
2004	24	1318	54.91667	38.42754
2005	24	1335	55.625	31.54891
2006	24	1330	55.41667	43.73188
2007	24	1288	53.66667	28.84058
2008	24	1297	54.04167	25.60688
2009	24	1295	53.95833	39.51993
2010	24	1290	53.75	48.80435
2011	24	1252	52.16667	44.05797
2012	24	1191	49.625	26.7663

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	34775.79	19	1830.305	51.11432	1.9E-100	1.609196
Within Groups	16471.71	460	35.80806			
Total	51247.5	479				

SUMMARY

Groups	Count	Sum	Average	Variance
1993	14	520	37.14286	9.362637
1994	14	536	38.28571	18.98901
1995	14	500	35.71429	47.45055
1996	14	502	35.85714	64.13187
1997	14	688	49.14286	189.3626
1998	14	684	48.85714	119.0549
1999	14	677	48.35714	36.24725
2000	14	655	46.78571	37.1044
2001	14	648	46.28571	48.68132
2002	14	624	44.57143	27.64835
2003	14	631	45.07143	30.07143
2004	14	635	45.35714	51.78571
2005	14	645	46.07143	50.68681
2006	14	659	47.07143	93.91758
2007	14	674	48.14286	89.82418
2008	14	679	48.5	116.1154
2009	14	699	49.92857	80.07143
2010	14	688	49.14286	109.3626
2011	14	694	49.57143	112.5714
2012	14	620	44.28571	64.83516

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	5805.414	19	305.5481	4.373487	1.69E-08	1.626697
Within Groups	18164.57	260	69.86374			
Total	23969.99	279				

Table 2: Analysis of Variance (ANOVA) of Capacity Utilization in the Production of (a) liquids) and (b) Tablets in Nigeria Pharmaceutical Industry From 1993-2012.

Information and Telecommunication Technology (ICT): A 70% of the respondents were not satisfied with telecommunication services when Nigeria Telecommunication Limited (NITEL) was the sole provider of telecommunication services in the 1990s. The respondents claimed that the global system of communication (gsm) has made information and telecommunication technology more accessible. All the 28 companies that responded have at least desk top and or personal computers as well as other electronic devices for ICT management in the organizations.

Some specific interventions: The Establishment of National Agency for Food and Drug Administration and Control The establishment of the National Agency for Food and Drug Administration and Control (NAFDAC) in the early 1990s was the most significant decision of the Government against the proliferation of fake and sub-standard pharmaceuticals in the country. All the respondents acknowledged the positive impact of the agency on drug business in Nigeria as it sanitized the drug manufacturing and advertisement to a great extent.

Petroleum (special) trust fund opinion was divided on the impact of the Petroleum Trust Fund (PTF) on the manufacturing sector. Seventy eight percent (78%) of the respondent organizations had marginal improvement in the capacity utilization of their facilities that was traced to the intervention.

Other interventions

Personal interview with some key players in the industry revealed that the pharmaceutical industry believes in the ability of the intervention fund to the industry by the Federal government in the form of NAFDAC-Central Bank of Nigeria (NAFDAC-CBN) fund to turn things around for better. It was generally agreed that the import prohibition of some essential drug impact positively on the industry.

The President's Emergency Plans for AIDS Relief (PEPFAR) funds and the current World Health Certification drive by some pharmaceutical companies are areas capable of significantly improving the capacity utilization in the pharmaceutical industry subsector of the economy.

Research and development profile of the pharmaceutical industry in Nigeria

Twenty respondent organizations (71.43%) carry out marketing related research with 1-5% of their profit after tax annually. Research on drug discovery was not carried out in any of the respondent organizations but limited formulation studies happened occasionally when an excipient is substituted. Ten (35.7%) of the respondents use locally fabricated equipment such as mixing tanks, mixers, scoops, stainless steel containers and simple liquid filling equipment for their Production. The survey showed that over 60% of the equipment used in the manufacture of liquid preparations was imported while tablets and capsules are manufactured using imported equipment.

Scientific workforce in the pharmaceutical industry

One hundred and forty four of the two hundred and fifty questionnaires were returned from the scientists working in the pharmaceutical manufacturing establishments. Thirty percent of the respondents were 23-33 years old while the remaining respondents were older but less than 55 years. Two of the respondents had PhD, one had Fellowship of the Postgraduate College of Pharmacists and 103 have other postgraduate qualifications. The survey revealed that 28 (19.4%), 17 (11.81%), 72 (50.0%) and 27 (18.75%) of the respondents had worked in the industry for 1-4, 5-10, 11-20 and over 20 years respectively. The workforce distribution of the respondents was 11, 39 and 50% in production, quality control and marketing comprising pharmacists (51%), Chemists and biochemists (39%) microbiologists

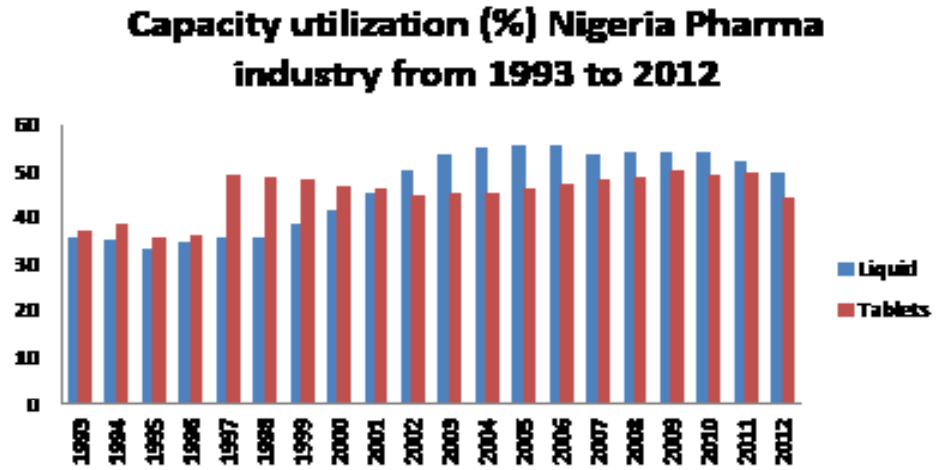

Figure 1: Average capacity utilization for tablets and liquid preparations from 1993-2012.

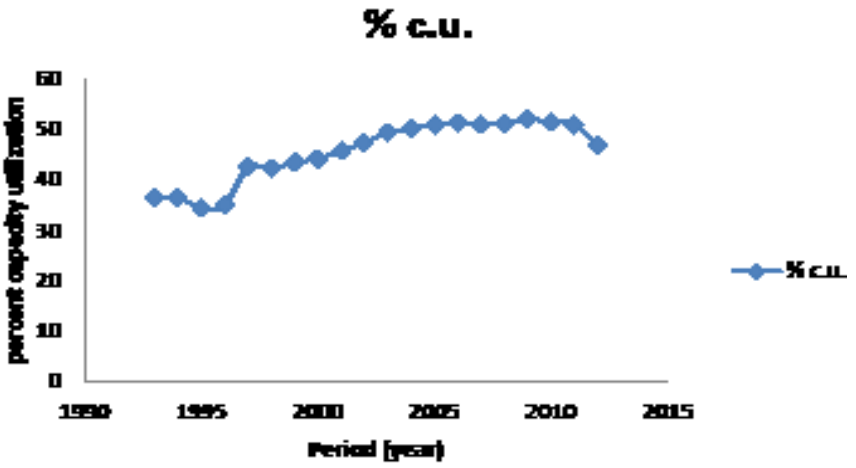

Figure 2: Combined average capacity utilization for tablets and liquid preparation.

(8%) and other scientists (2%). Job satisfaction among the scientific workforce ranged from 40-100%.The study showed that the employee in marketing were more satisfied with their jobs than their counterparts in either production or quality control.

Job security: Over 80% of the respondents felt secured in their current jobs and do not anticipate being fired or laid off by their organizations while 20% were not sure. About 75% of the workforce in marketing was likely to look for a higher pay opportunity in the next one year. The respondents claimed to have achieved 75-100% of the annual target rated on options of less than 50%, 50%, 75%, and 100% or above 100% achievement of annual target. Production and quality control workers met their targets more than their counterpart in marketing and sales.

Mental acuity utilization: The survey showed that mental acuity utilization in the area of competencies was less than 50%. Managerial capabilities of the respondents were rated as adequate by 33.3% (48) while the remaining 67.7% (96) claimed that management skills were inadequate for their current responsibilities. The respondents were evenly split in the rating of the on- the- job training as either adequate or inadequate.

Determinants of career choice: The determinants of choice of area of practice within the industry were monetary reward (40%), opportunity for promotion (18%), job security (16%), public perception (15%), job contents and challenges (11%).

Discussion

Both indigenous and multinational establishments are involved in the manufacture of pharmaceuticals in Nigeria and are concentrated in Lagos, the commercial nerve of the country, and the contiguous States. Establishment of a liquid manufacturing plant is relatively cheaper and easier due to fewer unit operations involved compared to either tablets or capsules and this may justify the higher number of liquid production facilities than of tablets. The political instability and power struggle, which affected other sectors of the economy, might be one of the reasons for decline in the capacity utilization in 1995 [6,7]. It was also probable that new requirements for manufacture and advertisements of drugs being introduced by NAFDAC were yet to be understood and complied with by the manufacturers.Generally, capacity utilization of 70-75% is required for a sector to experience productivity growth [8]. Manufacturing productivity growth is the increase in the efficiency and productive capacity of the manufacturing sector. The pharmaceutical manufacturing sector cannot produce beyond what they can sell and although government has made some interventions, there are still a

number of grey areas that need to be addressed. A number of huge investments have been made by local manufacturers to upgrade facilities to the internationally accepted standard and government must patronize local manufacturers in line with the public procurement Act of 2007 that advocates patronage of local manufacturers and domestic preference (LFN, 2007). It seems that factors other than lack of patronage from the government ministries, departments and agencies as claimed by some manufacturers may be responsible for the inability of the pharmaceutical industry to at least 60% the essential drug needs of the country [9]. Currently the following products are placed under import prohibition so as to encourage their local manufacture: paracetamol tablets and syrups, cotrimoxazole tablets syrups, metronidazole tablets and syrups, chloroquine tablets and syrups, hematinic formulations; ferrous sulphate and ferrous gluconate tablets, folic acid tablets, vitamin b complex tablet, multivitamin tablets, capsules and syrups, aspirin tablets [except modified released formulation and soluble aspirin], magnesium trisilicate tablets and suspensions, piperazine tablets and syrups, levamisole tablets and syrups, clotrimazole cream, ointments such as penicillin/gentamycin, pyrantelpamoate tablets and syrups and intravenous fluids such as dextrose and normal saline, among others [10]. Local manufacturers need to take advantage of this prohibition and sustain the country's requirement for these classes of drugs. This is necessary because any gap in their availability and supply can lead to faking of the same by unscrupulous elements. A number of other factors need to be addressed to improve capacity utilization. Total dependence on imported pharmaceutical raw materials, machinery and spare parts; inadequate availability of social infrastructure seems to outweigh the direct efforts of the government. Electricity has been found t to have a significant positive impact on manufacturing productivity growth rates in countries that have stable electricity supply [11]. Manufacture of HIV/AIDS drugs locally by those companies that have met the minimum international standards of GMP is highly needed, given that two third of the over 34 million world population of people living with HIV/AIDS are in the sub-Saharan Africa [12]. Moreover there is substantial allocation of funds for malaria and tuberculosis that the local industry can provide marching drug component requirements and thereby increase capacity. There would be sense in developing requisite expertise to produce higher percentage of the much needed essential drugs locally. Local production of the essential medicines will not only enhance access to good quality medicines but will also create employment opportunities.

Scientific workforce in the pharmaceutical industry

Company size and product lines are different and there exists considerable variability in the utilization of pharmacists and other scientists within industry. Benefits such as incentives bonuses, company automobile, stock options and potentials for and advancement more often than not account for how opportunities within the sections of the industry are rated and are the driving forces for seeking employment opportunities by many scientists. This can be a challenge to workforce availability in the other sectors of the industry. The manufacture of safe and efficacious medicines cannot take place without the input of skilled and motivated scientific workforce. One of the critical aspects of the long term sustainability of the pharmaceutical industry is enlargement of human capitals that can satisfy the diverse undertakings in the pharmaceutical manufacturing system. There must be a continuous linkage between the industry and the academia to be able to properly focus on training manpower that will meet the manufacturing and research skill needed in the industry.

Conclusion

A study of the capacity utilization in the last two decades in the pharmaceutical industry in Nigeria was carried out. There was association between the performance of the pharmaceutical industry in Nigeria and interventions of the government over the last two decades but the influence was marginal on the capacity utilization of the pharmaceutical industry over the period.The key to success for the development of raw materials for the pharmaceutical subsystem is the joint responsibility and pooling of resource for their relevant exploration by government and the pharmaceutical companies.

There is a positive relationship between capacity utilization and scale of operation in manufacturing. Increase in scale of operation with a particular machine would lead to corresponding increase in capacity utilization and this was the case during the PTF in many pharmaceutical manufacturing establishments.

Promotion and development of local fabrication of production machinery and their associated industries are essential for technological growth. Management of pharmaceutical industry should also focus on the financial cost of their human assets, imaginative and futuristic personnel policies.

A policy framework that projects local manufacturing and guarantee patronage by accredited health institutions will promote the growth of pharmaceutical industry, thus improving the capacity utilization as some of the companies upgrade their facilities to meet international standards.

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