بسم الله الرحمن الرحيم

Sudan University of Science and Technology

College of Graduate Studies

Evaluation of Applying The Good Labratory Practice System in the Pharmaceutical Industry - Case Study of Pharmaland Company 2018, Gezira state

تقويم تطبيق نظام الممارسة المعملية الجيدة في الصناعة الدوائية

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By:

Mohamed Dafaallh Hemidane Nasir

B-S.C (Honor) in Chemistry - Sudan University of Science and Technology 2005

Supervisor:

Dr. Mohamed Siddig Abdelaziz

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الإستهلال

قَالَ تَعَالَىٰ:

﴿ ٱقۡرَأۡ بِٱسۡمِ رَبِّكَ ٱلَّذِي خَلَقَ ١ خَلَقَ ٱلۡإِنسَٰنَ مِنۡ عَلَقٍ ٢ ٱقۡرَأۡ وَرَبُّكَ ٱلۡأَكۡرَمُ ٣ ٱلَّذِي عَلَّمَ بِٱلۡقَلَمِ ٤ عَلَّمَ ٱلۡإِنسَٰنَ مَا لَمۡ يَعۡلَمۡ ٥ ﴾

صدق الله العظيم

سورة العلق الآيات (1-5)

DEDICATION

TO:

MY PARENTS

MY SISTERS

MY BROTHERS

MY BIG FAMILY

MY LOVELY FRIENDS

ACKNOWLEDGEMENTS

I would like to thank the following people for their contributions both to this study and to my life during the period of the study. Without all of them, this thesis would never been written.

I am greatly indebted to my supervisor Dr. Mohamed Siddig Abdelaziz for his valuable advice, necessary support and encouragement during the development of my research.

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Thanks and appreciation to all my colleagues and consultants, who provided me the research material.

Finally, a special message of love and appreciation goes to my parents, who encouraged and provided me all the support and patience throughout the years of effort.

Abstract

This descriptive study was carried out in pharmaland company, during the period from January 2018 to june 2018, the study was aimed to evaluate of applying the good labratory practice system in the pharmaland company, Questionnaires were distributed to the (20) employees of the laboratories that apply GLP and then collected and analyzed using SPSS program, frequencies and percentages were calculated.

The study revealed the following results : quality manager (100.0%), organizational charts (90.0%), substitutes for key management (85.0%), laboratory's documentation responsibility (100.0%), information flow (100.0%), staff members awareness (90.0%),policy and procedure to ensure the confidentiality of the information (85.0%), Quality Manual (0.0%), top management periodic reviews (90.0%), internal quality audit (80.0%), policy for handling out-of-specification (85.0%), SOPs review (95.0%), SOPs written and approved for all testing activities (100.0%), SOPs approved by an authorized person (100.0%), SOPs available at the relevant location (95.0%), system for distribution of SOPs (100.0%), staff were trained for new and revised SOPs (95.0%), system of change control (95.0%), revised documents includes reference to previous documents (95.0%), records maintained for 2 years (100.0%), job descriptions (100.0%), SOP for identifying training needs (95.0%), staff undergoing training appropriately supervised (75.0%),training and education records available (80.0%),on the job training procedures for new employees (90.0%), formal evaluation after training (85.0%),

adequate laboratory facilities (95.0%), separate storage facilities maintained for the secure storage of samples, retained samples and reagents (80.0%), environmental conditions (75.0%), access restricted to authorized personnel (0.0%), archive facilities provided to ensure the secure storage and retrieval of all documents (75.0%), reagents and chemicals used in tests and assays of appropriate quality

(80.0%), reagents purchased from reputable suppliers (85.0%), reagents and solutions properly labelled (95.0%), reference standards properly stored (75.0%), procedure for qualification of secondary reference standards (85.0%), certificates of analysis from suppliers of primary reference standards available (80.0%), system for validation and regular revalidation of all equipment (45.0%), system to investigate and record all deviations from specifications or malfunctioning of equipment (55.0%), equipment purchased from an agent capable of providing full technical support and maintenance (85.0%), all equipment, instruments or other devices used for testing, verification or calibration, uniquely identified (95.0%), a procedure specifying that equipment and instruments cannot be used if they were beyond the calibration due date (90.0%), software appropriately validated (0.0%), back-files (85.0%),electronic data protected from unauthorized access (80.0%),procedure for reviewing and updating security access (50.0%), procedures in place for disaster recovery (0.0%), Sample test request form (95.0%), laboratory notebook (100.0%), the notebook contain documentary evidence (90.0%), notebook signed by the responsible analysts, verified and signed by the supervisor (100.0%), analytical procedures validation (45.0%), system suitability testing (85.0%), deviations from the test procedure (80.0%), SOP for investigation of out-of-specification (95.0%), general and specific safety instructions (80.0%), safety data sheets (0.0%), smoking, eating and drinking in the laboratory (90.0%), staff wear laboratory coats or other protective clothing including eye protection (95.0%), trained in first-aid techniques, emergency care (85.0%), staff trained in the safe handling of glassware, corrosive reagents and solvents (80.0%).

The study conclude that: some variables were well establish such as the organization and management, documentation , personnel, materials ,equipment and instruments ,working procedures and safety other variables were not well establish such as quality management system and computer systems .

المستخلص

أجريت هذه الدراسة الوصفية في شركة فارملاند للادوية ، خلال الفترة من يناير 2018 حتى يونيو 2018 ، هدفت الدراسة إلى تقويم تطبيق نظام الممارسة المعملية الجيدة في شركة فارملاند ، وزع الاستبيان على (20) موظفًا في الشركة. ثم جمع الاستبيان وحلل باستخدام برنامج SPSS، وحسبت الترددات والنسب المئوية.

كشفت الدراسة النتائج التالية : مدير الجودة (100.0%) ، الهيكل التنظيمي (90.0%) ، نائب مدير الادارة ، (85.0%)المسؤوليات في المعمل(100.0%) ، تدفق المعلومات (100.0%)،وعي الموظفين(90.0%)، السياسة وضمان سرية المعلومات (85.0%) ، دليل الجودة (0.0%) ، المراجعة الدورية للادارة (90.0%) ، التفتيش الداخلي للجودة (80.0%)، سياسة التعامل مع النتائج خارج المواصفة (85.0%) ، مراجعة اجراءات التشغيل (95.0%)، اجراءات التشغيل مكتوبة وموافق عليها لجميع الاختبارات (100.0%) ، جميع اجراءات التشغيل معتمدة من الشخص المسؤول (100.0%) ، اجراءات التشغيل موجودة في موقع التشغيل (95.0%) ، نظام التوزيع (100.0%) ،التدريب علي نظام التشغيل (85.0%) ، التحكم في نظام التغيير (95.0%)، الوثيقة الجديدة تتضمن مرجع للوثيقة السابقة (95.0%) ، الاحتفاظ بالسجلات لمدة عامين(100.0%) ،الوصف الوظيفي (100.0%) ، الاحتياجات التدريبية (95.0%)، الاشراف المناسب للمتدربين (75.0%)،سجلات التدريب والتعليم (80.0%)، طريقة التدريب للموظفين (90.0%)، التقييم بعد التدريب (85.0%)، المباني المناسبة للمعمل (95.0%)، مباني مفصولة لتخزين العينات والمحاليل (90.0%)، الظروف البيئية المناسبة (75.0%)، الدخول فقط للموظفين المصرح لهم (0.0%)، الارشيف المناسب لضمان التخزين الآمن والاسترداد للوثائق (85.0%)، الكواشف والمحاليل الكيمائية المستخدمة في الفحص عالية الجودة (80.0%)،الكواشف يتم شراؤها من وكيل معتمد(85.0%)، كل المحاليل المستخمة يجب ان تكون معرفة(95.0%) ، التخزين المناسب للمراجع القياسية (75.0%) ، طريقة تاهيل المراجع القياسية (85.0%)، شهادة التحليل للمراجع القياسية (80.0%)، التحقق واعادة التحقق للاجهزة (45.0%)، نظام التحقق من الاجهزة المعطلة (55.0%)، شراء الاجهزة من وكيل معتمد (85.0%) ، كل الاجهزه معرفة(95.0%) ، طريقة تحدد عدم استخدام الاجهزة غير المعايرة (80.0%)، التحقق من برامج اجهزة الحاسوب (0.0%)، تخزين الملفات الاحتياطية (85.0%)، البيانات الالكترونية محمية من الاشخاص غير المصرح لهم (80.0%)، اجراء مراجعة وتحديث الدخول الآمن للاشخاص (50.0%) ، اجراء حالات الكوراث (0.0%)، نموزج طلب فحص العينة (95.0%)، دفتر ثوثيق المختبر الآمن (10.0%) ، تفتر توثيق المختبر يحتوي على المعلومات الكافية (90.0%)، دفتر ثوثيق المختبر موقع من قبل الشخص

المشرف (100.0%)، التحقق من طريقة التحليل (45.0%)، اختبار ملاءمة النظام (85.0%)، ثوثيق الانحرافات (80.0%)، التحقق من النتائج الواقعة خارج المواصفة(95.0%) ، تعليملت السلامة العامة والخاصة(80.0%) ، بيانات السلامة (0.0%)، التدخين والاكل والشرب في المختبر (90.0%) ، معطف المختبرات وغيرها من ملابس الوقاية (95.0%)، تدريب الموظفين علي تقنيات الاسعافات الاولية (85.0%) تدريب الموظفين علي الاستخدام الآمن للادوات الزجاجية وغيرها (80.0%).

خلصت الدراسة إلى أن هنالك بعض العناصر مطبقة بنسبة عالية مثل الادارة والتوثيق والموظفين والمواد والاجهزة والمعدات وطريقة العمل و السلامة وبعض العناصر مطبقة جزئيا مثل نظام ادارة الجودة وانظمة الحاسوب.

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List of abbreviations

FDA Food and drug administration

PLP Pharmaland pharmaceutical

GLP Good laboratory practice

GMP Good manufacturing practice

OECD Organization for economic co-operation and development

QA Quality assurance

SOP Standard operating procedure

CNS Central nervous system

NMPB National medicines and poisons board

CFR Code of Federal Regulation

WHO World health organization

MHRA Medicines and healthcare products regulatory agency

MENA Middle east and north africa

EU European union

R&D Research and development

US FDA United state food and drug administration

ISO International organization for standardization

OHSAS Occupational health and safety managment

Chapter one

Introduction

Chapter 1

1.1 Introduction

Good laboratory practice is a quality system concerned with the organisational process and the conditions under which non-clinical health and environmental safety studies are planned, performed, monitored, recorded, archived and reported.The purpose of these principles of good laboratory practice is thus to promote the development of quality test data and to provide a managerial tool to ensure a sound approach to the management, including conduct, reporting and archiving, of laboratory studies. The principles may be considered as a set of criteria to be satisfied as a basis for ensuring the quality, reliability and integrity of studies, and the traceability of data (GLP, 2009).

The quality is the capability to systematically produce the same product to meet the same specifications time after time. GLP was altered to protect the integrity and quality of laboratory data (Seiler , 2005).

GLPs can be applied to virtually all industries in which laboratory work is conducted, including companies involved in drug development, manufacturing, foods, pesticides ,drink production, and engineering testing. In addition, commercial testing laboratories, research establishments, and universities (GLP , 2009).

Pharmaland is a subsidiary of hikma pharmaceuticals, the fast growing multinational pharmaceutical group that operates currently in the US , Europe and across the mena region. hikma has 27 manufacturing facilities in 11 countries,five of them are FDA approved (plp-pharma.com , 2018).

Pharmaland develops, manufactures, and markets branded and non-branded generic and in-licensed pharmaceutical products from different therapeutic categories with special focus in key therapeutic areas such as anti-invectives, diabetes, cardiovascular, CNS and oncology products (plp-pharma.com , 2018).

1.2 Objectives:

1.2.1 General objective:

To study the evaluate of applying the good labratory practice system in the pharmaceutical industry-parmaland pharmaceuticals company .

1.2.2 Specific objectives:

1. To evaluate management requirements of GLP.
2. To evaluate technical requirements of GLP.

Chapter Two

Literature Review

Chapter 2

2. Literature review

2.1 History of good laboratory practice:

The policies behind Good laboratory practice principles were created and developed in the USA in the 1970s by the food and drug administration (FDA). In the 1970s the FDA inspected some non-clinical laboratories and revealed that some pharmaceutical studies submitted in support of the safety of regulated pharmaceutical products had not been conducted in accord with good practice. The data were inaccurate or insufficient, and therefore inadequate to ensure the safety of the product. The FDA bases its decisions concerning safety on data from companies' studies, so the data must be correct and accurate. The FDA started drafting a policy for non-clinical laboratory practices that resulted in Good Laboratory Regulations (21 CFR Part 58, December 22, 1976). The regulations, which came into effect in June 1979, establish standards for the conduct and reporting of non-clinical laboratory studies (GLP , 2009).

The OECD countries followed the FDA's example and compiled principles of good laboratory Practice to promote public health and environmental safety in all OECD countries. These common principles are also intended to minimize technical trade barriers and make test data comparable between countries so that duplication of work can be avoided. Each OECD country has a regulatory authority responsible for monitoring and inspecting companies' compliance with these principles. Once validated in one OECD country, this makes it possible to operate in the whole OECD community. GLP principles can also be adopted in countries outside the OECD. GLP status in a non-OECD country can be approved by authorities in an OECD country and will then be accepted in all other countries (GLP , 2009).

2.2 Definition of GLP:

Good laboratory practice (GLP) is a quality system concerned with the organisational process and the conditions under which non-clinical health and environmental safety studies are planned, performed, monitored, recorded, archived and reported (OECD , 1997).

2.3 Purpose of GLP:

The purpose of these principles of good laboratory practice is to promote the development of quality test data .Comparable quality of test data forms the basis for the mutual acceptance of data among countries. If individual countries can confidently rely on test data developed in other countries, duplicative testing can be avoided, thereby saving time and resources. The application of these principles should help to avoid the creation of technical barriers to trade, and further improve the protection of human health and the environment (OECD , 1997).

Everyone makes mistakes that is why GLP is needed. GLP principles are a good idea even if you are not required to follow the standards. There are some simple rules such as: say what you do (with written standard operating procedures), do what you say (follow the procedures), be able to prove it (with good record keeping) (Jean , 2007).

2.4 Scope of GLP principles:

According to OECD principles “these principles of good laboratory practice should be applied to the non-clinical safety testing of test items contained in pharmaceutical products, pesticide products, cosmetic products, veterinary drugs as well as food additives, feed additives, and industrial chemicals. non-clinical health and environmental safety studies covered by the principles of good laboratory practice include work conducted in the laboratory (OECD , 1997).

2.5 Principles of Good Laboratory Practice:

2.5.1 Organization and management :

The laboratory should have managerial and technical personnel with the authority and resources needed to carry out their duties and to identify the occurrence of departures from the quality management system or the procedures for performing tests , calibrations, validation and verifiation, and to initiate actions to prevent or minimize such departures (WHO , 2010).

The management of a laboratory organization or company is ultimately responsible for the quality and integrity of the testing conducted in its laboratories (Carlsson , 1998).

2.5.2 Personnel:

Personnel must possess appropriate education, training and experience to perform the assigned tasks; the education, training and experience must be documented. Job descriptions must be available and current for each individual. The laboratory must have available the appropriate number of personnel required to perform each task as stated in the standard operating procedure ,personnel must take all necessary precautions to avoid contamination of any testing materials (Clasby , 2005) .

2.5.3 Quality management system:

The laboratory or organization management should establish, implement and maintain a quality management system appropriate to the scope of its activities, including the type, range and volume of testing , calibration, validation and verification activities it undertakes. The laboratory management should ensure that its policies, systems, programmes, procedures and instructions are described to the extent necessary to enable the laboratory to assure the quality of the test results that it generates. The documentation used in this quality management system should be

communicated, available to, and understood and implemented by the appropriate personnel (WHO, 2010).

2.5.4 Quality assurance programme:

GLP principles require that a company has a quality assurance unit and QA inspector that monitor and inspect the facilities and the operations carried out in the laboratory. the company has to have a quality assurance statement. the regular inspections by the company's own quality assurance unit are reported and the reports kept. the inspections should cover organizational issues (such as staff levels, qualifications, planning of work, understanding duties), procedures for QA, facilities (such as health, safety, hygiene requirements), test substances, laboratory operations (such as different laboratory operations for different activities, monitoring of environmental conditions, facilities for the retention of samples and records) and equipment (such as condition, tolerance). these inspections also cover manual data recording and computer generated data, as well as standard operating procedures, preparations of reports and archiving of them (Carlsson , 1998).

2.5.5 Standard Operating Procedures (SOPs)

The OECD principles state that GLP laboratories should have written SOPs and they should cover the following categories of laboratory activities: test and reference substance, apparatus and reagents, record-keeping, reporting, storage and retrieval, quality assurance procedures, and health and safety precautions. SOPs need not to be limited to these categories. OECD principles list the key issues in each required category .SOPs depend on the organization and activities of each laboratory. GLP principles require that SOPs should be approved by management (OECD ,1997) .

The SOPs must communicate their message effectively in the language currently used in the laboratory. Instructions should be written in the right order using clear

short words and terms, and short sentences where possible. Everyone involved should have immediate access to SOPs.

SOPs should be reviewed regularly, good SOPs signal the management's commitment to quality documentation and GLP (Carlsson ,1998).

2.5.6 Premises:

The laboratory facilities are to be of a suitable size, construction and location. These facilities are to be designed to suit the functions and operations to be conducted in them, rest and refreshment rooms should be separate from laboratory areas , changing areas and toilets should be easily accessible and appropriate for the number of users. The environmental conditions, including lighting, energy sources, temperature, humidity and air pressure, are to be appropriate to the functions and operations to be performed. The laboratory should ensure that the environmental conditions are monitored, controlled and documented and do not invalidate the results or adversely affect the quality of the measurements (WHO, 2010).

2.5.7 Equipment, material and reagents:

All appropriate equipment including computer systems with adequate capacity should be available, and they should be periodically inspected, cleaned, maintained and calibrated to ensure accurate performance. Dates and details of maintenance, repairs, calibration and any nonroutine work should be recorded and retained . All reagents and solutions in the laboratory areas shall be labeled to indicate identity, titer or concentration, storage requirements, and expiration date. Deteriorated or outdated reagents and solutions shall not be used (CFR ,1978).

2.5.8 Control of documentation :

The laboratory should establish and maintain procedures to control and review all documents that part of the quality documentation. A master list identifying the current version status and distribution of documents should be established and readily available (WHO, 2010).

2.6 Pharmaland pharmaceuticals company (PLP):

2.6.1 History of the company:

2.6.1.1 pharmaland pharmaceuticals :

Pharmaland pharmaceuticals was established in october 1995 as elie pharmaceuticals. The plant name was then changed to its current name upon acquisition by hikma pharmaceuticals in 2011

(Site master file, 2015).

Pharmaland pharmaceuticals head quarter is in Riyadh city, in the eastern part of Khartoum state, while the plant is in Al-bagair industrial area, Gazeera state, about 45 km in the south of Khartoum city (Site master file , 2015).

The plant site is well connected with the city of Khartoum by highway. Khartoum international airport is about one hour drive to the plant. communication facilities in Albagair area is highly developed including telephones network, mobiles and internet services .The plant is located in a pollution free area . There are no industries nearby that manufacture toxic (Site master file, 2015).

The plant composed of three different manufacturing units, each one is dedicated for a specific group of products : general formulations, penicillin based formulations and cephalosporin based formulations, administrative building, quality assurance, quality control laboratories, stores, maintenance and utilities are located outside the production area (Site master file , 2015).

2.6.1.2 Hikmah Pharmaceuticals :

Hikma pharmaceuticals is a fastgrowing multinational pharmaceutical group which was founded in 1978 in Jordan. the company develops, manufacturers, and markets a broad range of both branded and nonbranded generic and inlicensed products.Hikma is committed to the highest quality manufacturing with multiple USFDA approved facilities and products. Hikma operates in the US, Europe, and across the MENA region . Hikma was listed on the London Stock Exchange in 2005.The company has currently 27 state-of-the-art manufacturing facilities in 11 countries including US, Portugal, Germany, Italy, Jordan, Saudi Arabia, Sudan, Egypt, Algeria, Tunisia, Morocco and Ethiopia. Most of these facilities are USFDA and/or MHRA certified (Site master file , 2015).

Hikma has a diversified business models with three core businesses: branded generics, generics and injectable pharmaceuticals. The company sells over 1062 products in a wide range of dosage forms and strengths in more than 50 countries worldwide including MENA, US and 14 EU countries. In 2013 Hikma achieved revenues of $ 1.365 billion. Hikma's global team is currently over 7,200 employees . Hikma has R&D in many of its manufacturing facilities employing over 150 professionals and scientists (Site master file , 2015).

2.6.2 Pharmaceutical manufacturing activities:

The plant holds a valid license from the national medicines and poisons board (NMPB), Sudan for manufacturing the following dosage forms: tablets, hard gelatine capsules, dry suspensions, liquid syrups, and suspensions. the process of licensing for secondary packaging for oncology products and injectable antibiotics underway (Site master file, 2015).

2.6.3 PharmaLand products:

A wide range of different therapeutic categories are produced by pharmaland including the followings : anti-infective for systemic use anti parasitic products ,cardiovascular system genito-urinary system ,muscle-skeletal system ,central nervous system ,respiratory system alimentary tract and metabolism and oncology products .The current portfolio includes 60 different products in 106 dosage form, the pipeline involves technical transfer of important products from different hikma manufacturing facilities including Hikma (Jordan), Jazeera pharmaceuticals industries (Saudi Arabia), Hikma Egypt, and Promopharm (Morocco). The technology transfer project involves transferring different products from other Hikma sites based on valuable marketing department studies. the plant has also an ongoing project of secondary packaging for oncology products and injectable antibiotics (Site master file ,2015).

The company and many of its products are registered in neighbouring countries including Republic of South Sudan, Chad, Eritrea, and Yemen . Pharmaland pharmaceuticals represent the first local manufacture export to one of the neighbouring country Eriteria and processing to exports to other countries (Site master file, 2015).

Pharmaland pharmaceuticals start WHO-prequalification program to one of its tick transfer products (antimalarial) aiming to marketing this product in the international market and establishing quality system approved by international standard (Site master file, 2015) .

2.6.4 PLP Strategy:

2.6.4.1 Upgrading manufacturing capabilities:

To achieve its objective of meeting the highest manufacturing standards, pharmaland has been under an upgrading process since the acquisition in 2011. The plant will undergo a holistic upgrading during the 2nd half of 2013 and the 1st half of 2014 (Plp-pharma.com , 2018) .

2.6.4.2 Producing high quality products:

Pharmaland is highly committed to producing high quality products at affordable prices. Hikma pharmaceuticals manufacturing facilities has a strong reputation for quality products . hikma has been the first company in the region to obtain FDA and MHRA quality certificates . As part of hikma, pharmaland will strongly abide to world-class manufacturing (Plp-pharma.com , 2018).

2.6.4.3 Developing potential portfolio:

The continuous introduction of new products in the growing therapeutic areas is critical to the growth and profitability of our businesses . Pharmaland is building a smart and diversified product range in the growing therapeutic categories through different models including technology transfer from other hikma manufacturing facilities, R&D and in-licensed products. (Plp-pharma.com 2018)

Pharmaland focuses in developing anti-infectives, cardiovascular, diabetes, central nervous system (CNS), oncology and respiratory portfolios . Besides, the company also has interest in therapeutic categories that have special needs in the region such as anti-parasitic drugs . On the other hand pharmaland is in process of divesting all tail products inherited upon the acquisition. (Plp-pharma.com , 2018) .

2.6.4.4 New products' theme:

as part of the new company identity that reflects quality products, pharmaland has been changing the theme of the old products, including different product attributes including brand names, packaging themes, logo, inserts, etc (Plp-pharma.com , 2018) .

2.6.4.5 Advanced R&D capabilities:

Pharmaland is highly concerned with developing its R&D in terms of both highly qualified personnel and advanced equipments. R&D will play a crucial rule in enriching the company portfolio (Plp-pharma.com , 2018).

2.6.4.6 Partnership:

Developing successful partnerships is a key to accessing new products and new technologies that will enhance and expand our business. Pharmaland committed to developing partnerships with other pharmaceutical companies especially innovators to enrich portfolio. Based on its advanced manufacturing capabilities, strong sales and marketing team and its plans for geographical expansion, pharmaland is going to be the partner of choice for companies looking to market their products in Africa. Pharmaland already has partnership agreements including the agreement with Engelhard Arzneimittel, Germany, to manufacture and market prospan cough syrup in the world (Plp-pharma.com , 2018) .

2.6.4.7 Strong sales and marketing team:

Hikma pharmaceuticals sales and marketing team in Sudan has been considered a key differentiator among all rivals which enabled the company to lead the market in the previous 15 years. This experience was transferred to pharmaland sales and marketing team through absorbance of hikma culture and the transfer of key sales employees from hikma to pharmaland (Plp-pharma.com , 2018).

2.6.4.8 Expanding geographic reach:

pharmaland has an ambitious plan to expand its geographical reach outside Sudan to include most of sub-saharan african countries. The plant is currently registered in Sudan, republic of South Sudan, Eritrea and Chad. The 5 years business plan including registration in other countries especially in the region of east and central africa (plp-pharma.com , 2018) .

2.6.5 Plp future vision:

Pharmaland pharmaceuticals is committed to improve people's health and well-being globally with special focus in Sudan and Africa by providing high-quality, affordable medicines in the different therapeutic categories. The company is aiming to build a strong and diverse product portfolio that include highly specialized products through technology transfer from other hikma manufacturing facilities, new R&D products and partnership with leading multinational pharmaceutical companies. Pharmaland has a special consideration to quality manufacturing and will maintain the highest standards of manufacturing capabilities (Plp-pharma.com 2018).

Pharmaland vision is to build world-class manufacturing capabilities, and to become a pharmaceutical leader in africa with strong presence across the continent (Plp-pharma.com , 2018) .

Pharmaland social responsibility is always an integral part of the company. Pharmaland believes in touching people's lives through giving back to its local communities, employees, and the environment. the company is committed to collaborate with other partners in the medical field to raise the standards of medical services through strong participation in educational and training programs, medical conferences and exhibitions, and medical societies meeting and workshop (Plp-pharma.com , 2018) .

2.6.6 PLP Values:

2.6.6.1 Ethics:

Pharmaland is committed to the highest ethical principles and endeavour to ensure that all employees conform to the highest possible standards of integrity and honesty in everything we do (Plp-pharma.com , 2018) .

2.6.6.2 Human rights:

Pharmaland treats all people equally, and doesn't judge people by ethnicity, gender, religion, or on political bases. Pharmaland consider diversity as one of the strength of the company community (Plp-pharma.com , 2018).

2.6.6.3 Employees:

Pharmaland has a recruitment policy that ensures all applicants receive equal and respectful treatment. the selection processes ensure no biases regarding ethnicity, gender, religion, or political party. we recruit on the basis of competence only. Pharmaland has an 'equal treatment of employees harassment' policy, which states that we do not condone favouritism or inequality or judging people by in any shape or form (Plp-pharma.com , 2018) .

2.6.6.4 Suppliers :

Pharmaland exercises an extensive supplier selection process that ensures that chosen suppliers have the GMP certificate or its equivalent and our main suppliers are ISO 14001 and OHSAS 18001 certified (Plp-pharma.com , 2018) .

2.6.6.5 Customers :

Pharmaland has a customer-focused culture that considers maintaining sustainable relations with customers as a key strategy (Plp-pharma.com , 2018) .

2.6.6.6 Social responsibility :

Pharmaland consider its contribution to the community as an integral part of the company policy. the company is highly committed to play a major role in the development of the communities where it operates. Determined to preserve and protect the environment (Plp-pharma.com , 2018).

Chapter Three

Materials and Methods

Chapter 3

3. Materials and methods

3.1 Study design:

This is study, aimed to evaluate of applying the good labratory practice system in the pharmaceutical industry.

3.2 Study area

This study was conducted in pharmaland pharmaceutical company located in Gezira state.

3.3 Study period

This study was conducted in the period from January 2018 to june 2018 to study.

3.4 Data collection:

The check list contain 61 questions distributed to 20 empolyees of laboratories in pharmaland pharmaceutical company filled by analysts and supervisors of laboratories.

3.5 Data analysis

Collected data was analysed using the statistical package of social science computer program, frequency and percentage were calculated.

3.6 Ethical consideration:

Written permission was obtain from quality manger of pharmaland company to curry out the study.

Chapter Four

Results

Chapter 4

4. Results :

Table 4.1: Frequency of Organization and management variables

Question	Result	Frequency	%
Does the laboratory have a quality manager?	Yes	20	100%
	No	0	0%
	N/A	0	0.0%
Does the laboratory have organizational charts?	Yes	18	90.0%
	No	2	10.0%
	N/A	0	0.0%
Does the laboratory nominate substitutes or subordinates trained for key management ?	Yes	17	85.0%
	No	3	15.0%
	N/A	0	0%
Does the laboratory's documentation specify the responsibility and authority of all personnel?	Yes	20	100%
	No	0	0.0%
	N/A	0	0.0%
Does the laboratory ensure adequate information flow between staff at all levels?	Yes	20	100.0%
	No	0	0.0%
	N/A	0	0.0%
Are staff members aware of the relevance and importance of their activities?	Yes	18	90.0%
	No	2	10.0%
	N/A	0	0.0%
Does the laboratory have a policy and procedure to ensure the confidentiality of the information?	Yes	17	85%
	No	2	10.0%
	N/A	1	5.0%

Table 4.2: Frequency of Quality Management System variables

Question	Result	Frequency	%
Is there a quality manual ?	Yes	0	0.0%
	No	16	80%
	N/A	4	20%
Does top management hold periodic reviews to confirm continued conformance to the quality system?	Yes	18	90%
	No	2	10%
	N/A	0	0%
Is there an internal quality audit programme?	Yes	16	80%
	No	4	20%
	N/A	0	0%
Is there a policy for handling out-of-specification (OOS) results?	Yes	17	85%
	No	1	5%
	N/A	2	10%

Table 4.3: Frequency of Documentation variables

Question	Result	Frequency	%
Are the SOPs reviewed on a regular and defined schedule?	Yes	19	95.0%
	No	0	0.0%
	N/A	1	5.0%
Are there SOPs written and approved for all testing activities?	Yes	20	100.0%
	No	0	0.0%
	N/A	0	0.0%
Are revisions of SOPs approved by an authorized person?	Yes	20	100.0%
	No	0	0.0%
	N/A	0	0.0%
Are the SOPs available at the relevant location?	Yes	19	95.0%
	No	0	0
	N/A	1	5.0%
Is there a system for distribution of SOPs ?	Yes	20	100.0%
	No	0	0.0%
	N/A	0	0.0%
All relevant staff are trained for new and revised SOPs?	Yes	17	85.0%
	No	3	15.0%
	N/A	0	0.0%
Is the a system of change control in place to inform saff of new and revised document?	Yes	19	95.0%
	No	0	0.0%
	N/A	1	5.0%
Does revised document includes reference to previous document?	Yes	19	95.0%
	No	0	0.0%
	N/A	1	5.00%
Are records maintained for 2 years after the expiry dates?	Yes	20	100.0%
	No	0	0.0%
	N/A	0	0.0

Table 4.4: Frequency of Personnel variables

Question	Result	Frequency	%
Are there job descriptions for personnel?	Yes	20	100.0%
	No	0	0.0%
	N/A	0	0.0%
Is there an SOP for identifying training needs and providing the necessary training on a regular basis?	Yes	19	95.0%
	No	0	0.0%
	N/A	1	5%
Is staff undergoing training appropriately supervised?	Yes	15	75.0%
	No	2	10.0%
	N/A	3	15.0%
Are training and education records available?	Yes	16	80.0%
	No	0	0.0%
	N/A	4	20%
Are there on the job training procedures for new employees?	Yes	18	90.0%
	No	0	0.0%
	N/A	2	10.0%
Is there a formal evaluation after training?	Yes	17	85.0%
	No	1	10.0%
	N/A	2	10.0%

Table 4.5: Frequency of Premises variables

Question	Result	Frequency	%
Are there adequate laboratory facilities to perform required testing?	Yes	19	95.0%
	No	1	5.0%
	N/A	0	0.0%
Are separate storage facilities maintained for the secure storage of samples, retained samples and reagents ?	Yes	18	90.0%
	No	0	0.0%
	N/A	2	10%
Are environmental conditions appropriate to the functions and operations to be performed?	Yes	15	75.0%
	No	4	20.0%
	N/A	1	5.0%
Is the design adequate to protect the contents from deterioration and is access restricted to authorized personnel	Yes	0	0.0%
	No	14	70.0%
	N/A	6	30%
Are archive facilities provided to ensure the secure storage and retrieval of all documents?	Yes	17	85.0%
	No	0	0.0%
	N/A	3	15%

Table 4.6: Frequency of Materials , equipment and instruments

Question	Result	Frequency	%
Are all reagents and chemicals, including solvents and materials used in tests and assays of appropriate quality?	Yes	16	80
	No	4	20
	N/A	0	0
Are reagents purchased from reputable suppliers?	Yes	17	85
	No	3	15
	N/A	0	0
Are reagents and solutions properly labelled?	Yes	19	95
	No	1	5
	N/A	0	0
Are reference standards properly stored in a manner to protect them from deterioration?	Yes	18	90
	No	2	10
	N/A	0	0
Is there a procedure for qualification of secondary reference standards ?	Yes	17	85
	No	2	10
	N/A	1	5
Are certificates of analysis from suppliers of primary reference standards available?	Yes	16	80
	No	2	10
	N/A	2	10
Is there a system for validation and regular revalidation of all equipment ?	Yes	9	45
	No	7	35
	N/A	4	20
Is there a system to investigate and record all deviations from specifications or malfunctioning of equipment?	Yes	11	55
	No	5	25
	N/A	4	20

are equipment purchased from an agent capable of providing full technical support and maintenance?	Yes	17	85
	No	3	15
	N/A	0	0
Are all equipment, instruments or other devices used for testing, verification or calibration, uniquely identified?	Yes	19	95
	No	1	5
	N/A	0	0
Is there a procedure specifying that equipment and instruments cannot be used if they are beyond the calibration due date?	Yes	18	80
	No	0	0
	N/A	2	10

Table 4.7: Frequency of Computer Systems

Question	Result	Frequency	%
Does computer software appropriately validated?	Yes	0	0
	No	16	80
	N/A	4	20
Are back-files of computerized data created regularly and maintained?	Yes	17	85
	No	0	0
	N/A	3	15
Are electronic data protected from unauthorized access and maintain the traceability of any amendment?	Yes	16	80
	No	0	0
	N/A	4	20
is there the procedure for reviewing and updating security access when a person leaves the department or company?	Yes	10	50
	No	0	0
	N/A	10	10
Are there procedures in place for disaster recovery ?	Yes	0	0
	No	13	65
	N/A	7	35

Table 4.8: Frequency of Working procedures variables

Question	Result	Frequency	%
Is each sample submitted to the laboratory, accompanied by a test request form?	Yes	19	95
	No	0	0
	N/A	1	5
Does the laboratory have notebook for recording data from testing?	Yes	20	10
	No	0	0
	N/A	0	0
Does the notebook contain documentary evidence to confirm that the sample meets the requirements?	Yes	18	90
	No	0	0
	N/A	2	10
Is the completed notebook signed by the responsible analyst(s), verified and signed by the supervisor?	Yes	20	100
	No	0	0
	N/A	0	0
Does the laboratory ensure that all analytical procedures employed have been adequately validated?	Yes	9	45
	No	10	50
	N/A	1	5
Is system suitability testing performed prior to analysis?	Yes	17	85
	No	2	10
	N/A	1	5
Are any deviations from the test procedure approved and documented?	Yes	16	80
	No	2	10
	N/A	2	10
Is there an SOP for investigation of out-of-specification ?	Yes	19	95
	No	0	0
	N/A	1	5

Table 4.9: Frequency of Safety variables

Question	Result	Frequency	%
Are general and specific safety instructions reflecting identified risk available to each staff member?	Yes	16	80
	No	0	0
	N/A	4	20
Are safety data sheets available for the personnel prior to testing?	Yes	0	0
	No	11	55
	N/A	9	45
Is smoking, eating and drinking in the laboratory prohibited?	Yes	18	90
	No	0	0
	N/A	2	10
Does the staff wear laboratory coats or other protective clothing including eye protection?	Yes	19	95
	No	0	0
	N/A	1	5
Are members of staff trained in first-aid techniques, emergency care ?	Yes	17	85
	No	3	15
	N/A	0	0
Are members of staff trained in the safe handling of glassware, corrosive reagents and solvents?	Yes	16	80
	No	3	15
	N/A	1	5

Chapter Five

Discussion, Conclusion and Recommendations

Chapter 5

5. Discussion, Conclusion and Recommendations

5.1 Discussion

The study showed that the variable of laboratory organization and management gave very good results, this result was compatible with WHO guideline (WHO , 2010).

The study showed that the laboratory management system established, implemented out-of-specification policies, periodic reviews meeting and internal quality audit according to WHO guideline ,there was no quality manual this result was not fulfillment with WHO (WHO , 2010).

The study showed that the laboratory established and maintained procedures to control and review all documents according to WHO guideline(WHO , 2010).

The study showed that the laboratory have sufficient personnel with the necessary education, training, technical knowledge and experience for their assigned functions according to WHO guideline (WHO, 2010).

The study showed that the laboratory facilities are suitable size, construction and location according to WHO guideline(WHO , 2010).

The study showed that laboratories have not access limited and restricted to authorized personnel this result was not fulfillment with WHO (WHO , 2010).

The study showed that the laboratory equipment, instruments designed, constructed, adapted, located, calibrated, qualified, verified according to WHO guideline (WHO ,2010).

The study showed that the laboratory reagents and chemicals appropriate quality and purchased from reputable, approved supplier according to WHO guideline(WHO , 2010).

The study showed that the laboratory working procedures fulfillment with WHO (WHO , 2010).

The study showed that the laboratory general rules for safe working in accordance with WHO (WHO , 2010).

5.2 Conclusion:

From this study we can conclude that:

Some variables were well establish such as the organization and management, documentation , personnel, materials ,equipment and instruments ,working procedures and safety other variables are not well establish such as quality management system and computer systems .

5.3 Recommendations:

On the bases of this study we recommend that:

- Laboratory access should be established.
- Th softwares and analytical methods should be validated
- Procedure for disaster recovery should be established
- Quality manual should be established

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Appendices

GLP ASSESSMENT CHECKLIS

Participant name (Optional):……..

Date:……..

Job title:…….

Instruction: Please Check ☑ in the 'Y' column if information is collected ,confirmed. Check ☑ in the 'N' column if it is not. Check ☑ in the 'N/A' column if it does not apply. Comments are optional.

Item	Question	Y	N	NA	Comment
1.0 Organization and management					
1.1	Does the laboratory have a quality manager?	☐	☐	☐	
1.2	Does the laboratory have organizational charts?	☐	☐	☐	
1.3	Does the laboratory nominate substitutes or subordinates trained for key management ?	☐	☐	☐	
1.4	Does the laboratory's documentation specify the responsibility and authority of all personnel ?	☐	☐	☐	
1.5	Does the laboratory ensure adequate information flow between staff at all levels?	☐	☐	☐	
1.6	Are staff members aware of the relevance and importance of their activities?	☐	☐	☐	
1.7	Does the laboratory have a policy and procedure to ensure the confidentiality of the information?	☐	☐	☐	
2.0 Quality Management System					
2.1	Is there a Quality Manual	☐	☐	☐	
2.2	Does top management hold periodic reviews to confirm continued conformance to the Quality System?	☐	☐	☐	
2.3	Is there an internal quality audit programme ?	☐	☐	☐	
2.4	Is there a policy for handling out-of-specification (OOS) results ?	☐	☐	☐	

3.0 Documentation					
3.1	Are the SOPs reviewed on a regular and defined schedule?	☐	☐	☐	
3.2	Are there SOPs written and approved for all testing activities?	☐	☐	☐	
3.3	Are revisions of SOPs approved by an authorized person?	☐	☐	☐	
3.4	Are the SOPs available at the relevant location?	☐	☐	☐	
3.5	Is there a system for distribution of SOPs ?	☐	☐	☐	
3.6	All relevant staff are trained for new and revised SOPs?	☐	☐	☐	
3.7	Is the a system of change control in place to inform saff of new and revised document?	☐	☐	☐	
3.8	Does revised document includes reference to previous document?	☐	☐	☐	
3.9	Are records maintained for 2 years after the expiry dates?	☐	☐	☐	
4.0 Personnel					
4.1	Are there job descriptions for personnel?	☐	☐	☐	
4.2	Is there an SOP for identifying training needs and providing the necessary training on a regular basis?	☐	☐	☐	
4.3	Is staff undergoing training appropriately supervised?	☐	☐	☐	
4.4	Are training and education records available?	☐	☐	☐	
4.5	Are there on the job training procedures for new employees?	☐	☐	☐	
4.6	Is there a formal evaluation after training?	☐	☐	☐	

5.0 Premises					
5.1	Are there adequate laboratory facilities to perform required testing?	☐	☐	☐	
5.2	Are separate storage facilities maintained for the secure storage of samples, retained samples and reagents ?	☐	☐	☐	
5.3	Are environmental conditions appropriate to the functions and operations to be performed?	☐	☐	☐	
5.4	Is the design adequate to protect the contents from deterioration and is access restricted to authorized personnel	☐	☐	☐	
5.5	Are archive facilities provided to ensure the secure storage and retrieval of all documents?	☐	☐	☐	
6.0 Materials ,equipment and instruments					
6.1	Are all reagents and chemicals, including solvents and materials used in tests and assays of appropriate quality?	☐	☐	☐	
6.2	Are reagents purchased from reputable suppliers?	☐	☐	☐	
6.3	Are reagents and solutions properly labelled?	☐	☐	☐	
6.4	Are reference standards properly stored in a manner to protect them from deterioration?	☐	☐	☐	
6.5	Is there a procedure for qualification of secondary reference standards ?	☐	☐	☐	
6.6	Are Certificates of Analysis from suppliers of primary reference standards available?	☐	☐	☐	
6.7	Is there a system for validation and regular revalidation of all equipment ?	☐	☐	☐	

6.8	Is there a system to investigate and record all deviations from specifications or malfunctioning of equipment?	☐	☐	☐	
6.9	are equipment purchased from an agent capable of providing full technical support and maintenance?	☐	☐	☐	
6.10	Are all equipment, instruments or other devices used for testing, verification or calibration, uniquely identified?	☐	☐	☐	
6.11	Is there a procedure specifying that equipment and instruments cannot be used if they are beyond the calibration due date?	☐	☐	☐	
7.0 Computer Systems					
7.1	Does computer software appropriately validated?	☐	☐	☐	
7.2	Are back-files of computerized data created regularly and maintained?	☐	☐	☐	
7.3	Are electronic data protected from unauthorized access and maintain the traceability of any amendment?	☐	☐	☐	
7.4	is there the procedure for reviewing and updating security access when a person leaves the department or company?	☐	☐	☐	
7.5	Are there procedures in place for disaster recovery ?	☐	☐	☐	
8.0 Working procedures					
8.1	Is each sample submitted to the laboratory, accompanied by a test request form?	☐	☐	☐	
8.2	Does the laboratory have notebook for recording data from testing?	☐	☐	☐	

8.3	Does the notebook contain documentary evidence to confirm that the sample meets the requirements?	☐	☐	☐	
8.4	Is the completed notebook signed by the responsible analyst(s), verified and signed by the supervisor?	☐	☐	☐	
8.5	Does the laboratory ensure that all analytical procedures employed have been adequately validated?	☐	☐	☐	
8.6	Is system suitability testing performed prior to analysis?	☐	☐	☐	
8.7	Are any deviations from the test procedure approved and documented?	☐	☐	☐	
8.8	Is there an SOP for investigation of Out-of-Specification ?	☐	☐	☐	
9.0 Safety					
9.1	Are general and specific safety instructions reflecting identified risk available to each staff member?	☐	☐	☐	
9.2	Are safety data sheets available for the personnel prior to testing?	☐	☐	☐	
9.3	Is smoking, eating and drinking in the laboratory prohibited?	☐	☐	☐	
9.4	Does the staff wear laboratory coats or other protective clothing including eye protection?	☐	☐	☐	
9.5	Are members of staff trained in first-aid techniques, emergency care ?	☐	☐	☐	
9.6	Are members of staff trained in the safe handling of glassware, corrosive reagents and solvents?	☐	☐	☐	