

Analysis and Research of Market Insights in Global Healthcare

A Dissertation

Submitted in the partial fulfillment of the requirements for
the award of the degree of

Master of Technology

In

Biotechnology

SUBMITTED BY

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DECLARATION

I hereby declare that the work being presented in the dissertation report entitled “Analysis and Research of Market Insights in Global Healthcare” submitted by me for the award of the degree of Master of Technology in the Department of Biotechnology, TIET University, Patiala is a true and original record of my own independent and original research work carried out under the supervision of Mr. Aamir Manzoor Lone. Further, I declare that no part of this dissertation has been submitted to any other University/ Institute for the award of any degree in India or abroad.



DATED: 28-07-2022

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CERTIFICATE

This is to certify that Ms. Rakshita has prepared this project titled “**Analysis and Research of Market Insights in Global Healthcare**”, submitted by Rakshita (602004018) in partial fulfillment for the award of the degree Master of Technology in Biotechnology from the Thapar Institute of Engineering and Technology, Patiala Punjab is the record of the candidates own independent and original research work carried out under our supervision and guidance. The matter embodied in this dissertation has not been submitted in part to any other University/ Institute for the award of any degree or diploma in India or Abroad.



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I would like to express my heartfelt appreciation for their genuine assistance, which was extremely beneficial to my theoretical and practical studies.

A handwritten signature in black ink, appearing to read 'Rakshita' with a stylized flourish underneath.

DATED: 28-07-2022

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ABBREVIATIONS

GRG	Growman Research Group
LATAM	Latin America
APAC	Asia-Pacific
EU	European Union
KOL	Key Opinion Leader
QC	Quality Control
CATI	Computer Assisted Telephone Interviewing
UI	User Interface
HCP	Healthcare Professional
NSCLC	Non-Small Cell Lung Carcinoma
PD1	Programmed cell death protein 1
G6PD	Glucose 6- Phosphate Dehydrogenase

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ABSTRACT

The research that I was doing is based on Analysis and Research of market insights in global healthcare. I have done several projects and, in those projects, I conducted qualitative and quantitative research on various diseases and nutritional supplements. I have also conducted interviews with medical professionals all over the globe using CATI (Phone-based data collection) and CAWI (Web-based data collection) capabilities and collected that data to gain insights for the projects.

During one year, I worked on numerous projects, first was carried out to better understand the perspectives of Key Opinion Leaders, Healthcare Professionals, Company Executives, Regulatory Experts, and Payers in their respective markets on Solid Tumors, particularly Hepatocellular Carcinoma, Gastric Carcinoma, Non-Small Cell Lung Carcinoma, and Esophageal Carcinoma in countries such as the UAE, Turkey, South Africa, Saudi Arabia, Egypt, and Lebanon. The second study was conducted to have a better understanding of Oral Nutrition Supplements in Malaysia and Singapore. The third study was the Prevalence and Testing of Glucose-6-Phosphate Dehydrogenase Deficiency in Indonesia and Vietnam.

We were expected to collect responses from healthcare professionals who were experts in these studies, as well as conduct secondary research, in order to provide relevant insights to our clients. So, the main goal of these studies was to identify current market trends and provide necessary insights.

OVERVIEW OF THE ORGANIZATION

ORGANIZATION

Growman Research Group is an organization that provides services such as primary market research in the global healthcare industry. The core industrial perception of the experts at GRG drives their research and intelligence capabilities. The organization's backbone is a dedicated staff of life sciences market researchers that also drives innovation in essential research services and methodology.

The company's network of more than three hundred independent researchers spanning 39 APAC and EU nations is one of the most distinctive approaches to regional fieldwork. This provides us a field presence in all these countries, which benefits our clients greatly.

Their research services are customized to meet the demands of each client via specialized research procedures that have enabled the clients to accomplish difficult studies with ease.

KOL Research, Treatment Flow Analysis, Sales Strategy, Market Access Stakeholders, and Market Research are some of the core services provided to the clients. Also, their team has performed telephone-based market research surveys in around 56 countries across the Asia Pacific and Europe.

GRG has competence in establishing unique research procedures, allowing their personnel to successfully deliver some difficult studies and their outcomes. GRG has two in-house research groups, one specializing in quantitative research and the other in qualitative research.

They assist clients in selecting the appropriate data collection method and deliver high-quality services. After reviewing the data acquired during the fieldwork, actionable insights are provided to the clients. Their research panel includes 1.3 million highly engaged respondents from a variety of industries, ensuring that the work approach is diverse.



Figure 1- Icon of GRG

ACTIVITIES OF THE ORGANIZATION

GRG guarantees that efforts are made to improve data quality, such as live monitoring of video conversations, regular quality checks by the Survey Quality team, day-to-day training programs for researchers, and sharing best practices with various teams.

Below are the services for project execution:

- Questionnaire Proofing
- Survey Localization and Translation
- Sample Planning and Development
- Multilingual support
- Data Entry
- Analysis and Reporting

GRG has a dedicated team of expert transcribers that help the company build and integrate complex questions and get them online. The project managers work closely with the survey programming team to ensure that clients' needs are met. The survey programming experts have extensive domain knowledge and are well-versed in the client's requirements. The survey programming team worked on multilingual surveys and can create questionnaires with complicated logic checks that aid in worldwide collaboration. Their commitment to delivering high-quality work on schedule sets them apart from the competition.

COMPETITION INTELLIGENCE: On a daily basis, pharmaceutical and medical device firms encounter challenges and GRG gathers competitive intelligence from experts and on the ground to help with these challenges. Competitive intelligence is defined as a superior set of two levels of insights– global and regional. When it comes to the changing landscape of Asia-Pacific emerging markets, LATAM and the Middle East, and developed markets in the EU, GRG's "circle of researchers" has an impressive performance in collecting comprehensive competition intelligence on both global and regional levels. They employ both expert interviews and secondary research to gather validated knowledge regarding competitiveness.

MARKET ACCESS INSIGHTS: Market access has been more crucial in the last 5 to 10 years, as a growing number of high-tech, costly medications have entered the market, and governments and/or healthcare systems have been under great pressure to reduce drug costs. GRG creates a variety of programs, performs CATI and online surveys, and provides easy-to-understand real-time information to provide insights into various market landscapes.

KOL MARKET INSIGHTS: GRG finds and profiles leaders' opinions across custom needs, as well as maps KOL's impact regionally and nationally. Healthcare organizations from all over the world are looking at the necessity for an effective and efficient KOL management strategy as a major strategic area for their annual growth from a global perspective. GRG's KOL circle of specialists offers fresh perspectives on thought leaders. Its ability to identify and manage KOLs has aided its success.

BENEFITS FOR THE CLIENT: The clients benefit from a customized approach to KOL identification since it helps them better comprehend the opinion leader landscape.

ORGANIZATIONAL STRUCTURE

Roles and responsibilities of the respective teams are given below:

SALES TEAM-

- Ensure a smooth project flow with a client interface.
- To keep the Client updated on any modifications to the process.
- Regular client follow-up for any feedback on the quality of the work/output.

PRESALES TEAM-

- Calculate costs and assess the feasibility of work within desired timelines in collaboration with the Project Lead (PL), and share the results with the sales team.

KOL PROFILING TEAM-

- Will directly interface with the Client for all new requests (and any volume of work)
- To work out timelines, resourcing, and allocation of profiles.
- To collate the work and coordinate between all the teams (Quality check team, editorial team, drafting team)
- To draft and ensure quality and conduct last mile QC check.
- To deliver the final draft to the Client.
- To take up regular calls with Client and to send regular status updates (once a week)
- To follow up with the Client on any feedback on the work & to work on the feedback (if any) and deliver the final output.
- To close the request and to notify the Sales and Finance team about the closing of the project.
- Will list down all the learnings, and improvement points & ensure continuous incorporation of the same into the training documents.

WORKFLOW OF THE ORGANIZATION

QUALITATIVE AND QUANTITATIVE RESEARCH

There are two independent in-house research groups in the organization, each specializing in quantitative and qualitative research. A staff of expert researchers helps direct and perform search projects in various languages and at an inexpensive price. GRG aids customers in selecting the optimal data collection medium, and after examining the data collected during fieldwork, actionable insights are delivered in accordance with the client's needs.

HEALTHCARE AUDIENCE REACH

Consumer Ailment, Physicians, and Other Healthcare Professional Databases are all part of the healthcare respondent database of GRG. The database's unequalled access to KOLs, Market Access Stakeholders, Trade Professionals, Distributors, Health Economists, Lab Professionals, Lab Owners, and others is one of its primary highlights and differentiators.



Figure 2- Qualitative & Quantitative research

MATERIALS USED

HARDWARE

- 1. Laptop:** It is a machine that follows the operator's set of programmes or instructions. These systems were used to complete various tasks using Microsoft Word and Excel. This provided ease in making transcripts and punching the links.



Figure 3- Laptop

- 2. Headphones:** These were used for carrying out telephonic interviews in the company.



Figure 4- Headphones

SOFTWARE

1. **Ameyo:** It is an online software used by the company for calling purposes. Via the utilization of this software one can call internationally as well as nationally. The call is automatically recorded in this software and used for internal quality control procedures inside the organization. It was used to conduct telephonic interviews in the organization.

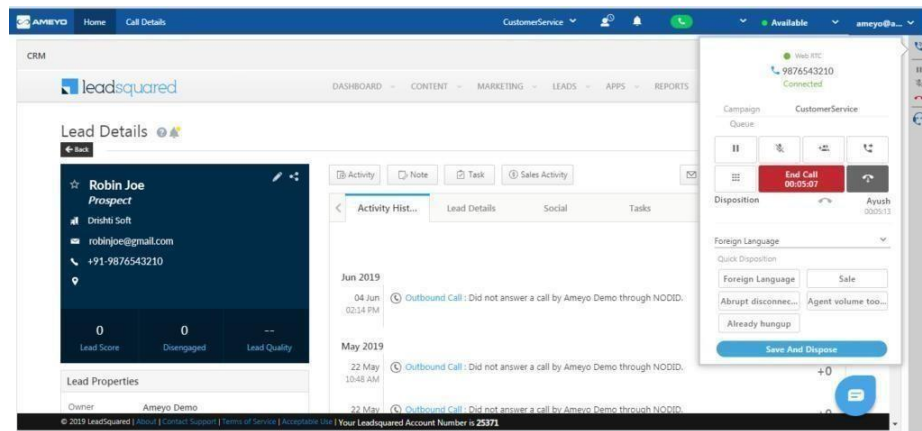


Figure 5- Screenshot of Ameyo

2. **Zoom:** This is an application that allows the user to share their laptop or desktop screen with the individual they want to. It was utilized for sharing the screen with specific key opinion leaders in order to gather market insights.

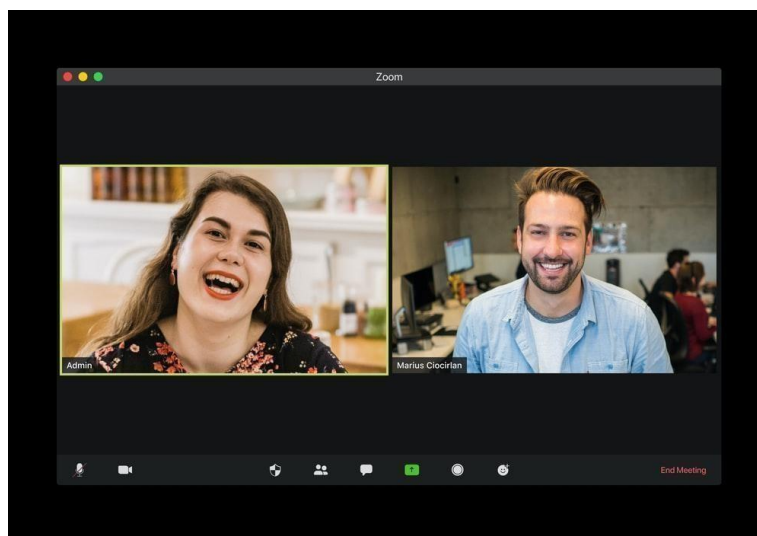


Figure 6- Screenshot of zoom

3. **Microsoft teams:** It is a software utilized for communication within the team. Daily meetings were also conducted via this application.



Figure 7- Screenshot of Microsoft teams

REVIEW OF LITERATURE

Markets are always changing, and firms must comprehend both supply and demand. As a result, the primary function of market research is to offer firms information with a deep understanding of consumers and the market in order to design products and services that exceed the competition's needs. The primary goal of market research is to provide answers to queries and to help in the acquisition of new knowledge. The Market research contains gathering and analyzing consumer, competition, and market trend data. This allows the customer to more properly assess the degree of demand for its products. It also influences decisions to direct capital investment toward projects with the highest return on investment, such as building a new store or entering a new market. Consumer input is obtained through market research. It is critical for the consumer to learn what they think about the company's products, branding, and services. This allows the company to achieve its demands while outperforming its competitors. It assists the company in developing a clear and informed strategic business strategy toward which all business colleagues can collaborate.



Figure 8- Market research analysis

NEED FOR MARKET RESEARCH

It is critical for any decision-maker to identify and understand the customers, what they want in terms of products and services, and their purchasing power or capacity. Because of the globalization of the marketplace, the system has become highly segmented, increasing the divide between customers and decision-makers. Customer retention is an important part of every successful organization. Most people fail to handle their consumers' ever-changing demands and standards, and as a result, they lose their customer base. Considering this, market research can be broadly classified into Problem identification research and Problem-solving research.

Classification helps in gaining a better understanding of the topic at hand. When it comes to the two sorts of market research, however, there are no hard and fast rules. A research study can have both types at the same time.

Problem Identification Research: This is the first step in the marketing research process. It basically includes having a clear and exact understanding of the problem at hand. It is critical that the research team recognizes, comprehends, and characterizes the problem in its totality, as this affects all future activities in the research process. To arrive at an appropriate problem definition, research teams rely on customer input, internal and external data reports, sales graphs, purchase trends, and so on. It helps in the identification of new market prospects for both existing and new items. It gives data on market share, competition, customer experience, overall sales, and distribution system. This assists businesses in problem-solving.

Problem Solving Research: Determining the proportion of women who prefer hormone replacement therapy for the treatment of vulvo vaginal atrophy and segmenting them based on purchasing power.

CONTENTS OF MARKET RESEARCH

Quantitative research is numerically focused, necessitates close attention to market phenomena measurement, and frequently involves statistical analysis. A bank, for example, may ask consumers to assess its overall service as outstanding, good, terrible, or very poor. This will provide quantitative data that can be statistically measured. The primary rule of quantitative research is that all respondents are asked the same set of questions. The method is very structured and typically includes a significant number of interviews/questionnaires.

The market research survey is perhaps the most popular quantitative technique. These are projects that entail the collecting of data from a variety of instances, such as a consumer or a set of Products. Post (self-completion), face-to-face (in-street or in-home), telephone, email, or web approaches can be used to conduct quantitative surveys. The questionnaire is one of the more typical instruments for gathering survey data, however, it is just one of several data collection aids.

Qualitative research elaborates how or why things are the way they are. A Market Researcher, for example, may approach a consumer who has purchased a specific type of bread and inquire as to why that particular brand of bread was chosen. In contrast to quantitative research, there is no fixed list of questions in qualitative research; instead, a subject guide (or discussion guide) is utilized to investigate diverse themes in depth. The interviewer's (and moderator's) interaction with the responder is heavily influenced by the respondents' own views and feelings.

	Qualitative Research	Quantitative Research
Goal	To gain an understanding of reasons and motivations To uncover trends in opinion It asks: 'Why', 'How', 'What'.	To quantify data and generalize results. It asks: 'How many', 'How often', 'How much'.
Sample	A small number of non-representative cases	A large number of cases representing the population of interest
Data collection	Interviews, focus groups...	Surveys, simulations...
Data analysis	Non-statistical	Statistical

Figure 9- Difference between qualitative & quantitative research

OBJECTIVES

- To discuss the market research analysis.
- To discuss different methods that are used in market research.
- To gain an understanding of the views of Key Opinion Leaders, Healthcare Professionals, Company Executives, Regulatory Experts, and Payers in their respective markets on Solid Tumors, particularly Hepatocellular carcinoma, Gastric Carcinoma, Non-Small Cell Lung Carcinoma, and Esophageal Carcinoma.
- To better understand the prevalence of Oral Nutrition Supplements and Diabetic Nutrition Supplements in Singapore and Malaysia.
- To better understand the knowledge, perception, prevalence, and practice around the G6PD testing among healthcare providers who work in the private sector.

METHODOLOGY

Following are the various methods that were utilized for the projects assigned:

- **Primary research:** During this research procedure insights and data were gathered by performing interviews and gained directly through respondents.
- **Secondary research:** This research method was utilized to collect information through research papers that are available in trusted databases.
- **Qualitative research:** It is a type of research in which descriptive information is obtained that is composed in the form of transcripts.
- **Quantitative research:** In this specific research process numerical data is collected through online surveys.

Procedure:

- For a conversation or an interview, the expert management team reaches the target audience from the target regions.
- The team uses a series of screener questions to determine if the targeted population qualifies as a respondent in accordance with the client's needs.
- After passing the screener requirements, targets are recruited.
- Through comprehensive secondary and geography-specific cold calling, we the operations team obtain a full grasp of the project.
- All members of the operations team working on the project are required to have a thorough grasp of the project so that we are familiar with the questions being asked of the respondents and can contextually comprehend their responses.
- After a target has been recruited, a virtual meeting with them is set up via zoom at a time that is convenient for them.
- The survey questions, as submitted by the client, are presented to the respondent during the planned Zoom conference.
- The meeting is recorded in a transcript-based survey, and the operation team transcribes the responses from that recording.
- Members of the QC team perform a quality check on each transcript to confirm that the answers written match those provided by the respondent.
- The transcripts are then compiled and forwarded to the client, on a rolling basis.

DETAILS OF THE TASKS PERFORMED

Following are some of the projects assigned by the team leader to me during which Qualitative and Quantitative research was performed to obtain data.

PROJECT 1: SOLID TUMORS MARKET ASSESSMENT

AIM- The purpose of this project was to gain an understanding of the views of Key Opinion Leaders, Healthcare Professionals, Company Executives, Regulatory Experts, and Payers in their respective markets on Solid Tumors, particularly Hepatocellular carcinoma, Gastric Carcinoma, Non-Small Cell Lung Carcinoma, and Esophageal Carcinoma.

THEORY- Solid tumors are types of tumors that do not contain any liquid in the tissue that is proliferating abnormally. Certain types of solid tumors were the focus of this study, namely, Hepatocellular carcinoma, Gastric Carcinoma, Non-Small Cell Lung Carcinoma, and Esophageal Carcinoma.

Our customer sent us a questionnaire, and we had to obtain information using primary research from particular key opinion leaders who worked for various companies and hospitals that had expertise in Solid Tumors, particularly the four solid tumors mentioned, i.e., Hepatocellular carcinoma, Gastric Carcinoma, Non-Small Cell Lung Carcinoma, and Esophageal Carcinoma. The insights required by the client regarding these solid tumors included data on pharmaceutical laws and regulations, hospital formularies, government authorities responsible for drug market approvals, the incidence of cancer indications in the particular country, and the insurance availability of immunotherapeutic choices for the mentioned cancer types.

Following are the respondent profiles that were interviewed:



Following are the Countries from where it was required to recruit the Respondent profiles:



Following are the screening criteria to be followed for the recruitment of the respective respondents:

- 1. HCP:** Cancer specialist for the target indications, with at least 8-10 years of experience in consulting/treating more than 10 patients per month in one or more of the indication areas.
- 2. KOL:** A head/director of the oncology department at a leading cancer specialist hospital (public/private). A member of the advisory board of a professional member organization related to oncology/immunotherapy/monoclonal antibody therapy. A regular speaker at conferences related to cancer therapies or author of publications focusing on the same in their respective countries.
- 3. PAYOR:** A senior-level executive with knowledge of claims management, reimbursement, and formulary management. A person who would be able to share insights on the policy side of the insurance business, including the arrangements with drug manufacturers and insurance products (which cover cancer treatment).
- 4. REGULATORY EXPERT:** A market access consultant with strong experience and focus on regional market access, as well as pricing & reimbursement trends for oncology indications. A senior company executive in Director or above relevant regulatory role focusing on oncology drugs – at least 10 years of relevant industry experience.
- 5. COMPANY EXECUTIVE:** Company executives (current or recent formers) who can provide insights on the overall market landscape focusing on key competitors, and their sale's organizational structure, go-to-market, and pricing strategies.

Below is the discussion guide for one of the respondent profiles:

RESPONDENT TYPE: COMPANY EXECUTIVE

SECTION A - MARKET LANDSCAPE (FOCUS ON NSCLC, ESOPHAGEAL CANCER, HEPATOCELLULAR CARCINOMA, AND GASTRIC CANCER)

- At a very high level, what does the market landscape for solid tumors look like today?
- How big is the solid tumor treatment market - in terms of value?
- Are you able to share an approximate breakdown of the market by the four tumor types - NSCLC, Esophageal cancer, Hepatocellular carcinoma, and Gastric cancer?
- How do you see the growth of the solid tumor treatment market over the next 3-5 years? What are the key drivers of growth?
- Please elaborate on the market landscape in your country specific to PD1/PDL1 drugs
- Who are the key players operating in the solid tumor market and how are they positioned? Probe and ask about BMS, MSD, and AstraZeneca
- How has the competitive landscape changed in recent years?
- For the four tumor types mentioned above, who are the key client segments? Probe and ask about private clinics, large hospitals, government hospitals, and organizations
- What companies do investigators feel loyal to?
- What efforts are being taken by sponsors of approved drugs to create disease awareness and help physician practices in the country?
- Most promising pipeline assets in development? Ongoing clinical trials in the country and their status – what is expected to start within the next year or two?

- Do you think that expensive treatment options like monoclonal antibodies, other biologic modalities are available in all treatment sites? Or are these restricted to bigger hospitals or larger academic centers?
- How do you see physicians choosing treatment options? What drives selection of a particular agent over another? What data with new PD1 agents will make physicians choose one over established PD1s?

SECTION B - GTM STRATEGY

- Are there specific regional/national level committees that influence/drive the choice of treatment options among all available options? How are those decisions made?
- Are there specific regulatory incentives that can be leveraged in the country to accelerate drug development and bring to market faster?
- What is the typical go-to-market strategy adopted by pharma companies for solid tumor drugs?
- Who typically buys the product? Is it private clinics, larger hospitals, or government organizations?
- What are some of the physician engagement initiatives? Are there any speaker programs conducted?
- What are some of the key channels leveraged by top players to enhance their market access / market penetration? Is working with a local distributor common, or is it better to establish own presence? What about warehousing and logistics?
- Is your company leveraging any KOL relations or physician engagement activities or other similar programs to improve its positioning in the market?
- How has the pandemic changed your marketing channels as well as your sales and marketing strategy?

- In some of the other markets, we've seen companies and their sales teams shifting to more digital meetings vs in-person visits. Has this been the case even with you?
- Have you seen a recent shift in sales strategies? If yes, please explain what are those?
- From your knowledge and experience, what should be the ideal messaging strategy used by companies to get a competitive edge in markets like {{CountryName}}?
Probe - Is this the strategy that your company has adopted in {{CountryName}}?
- What approaches are multinational pharma companies taking to enter {{CountryName}}?
Are they partnering with local companies or acquiring local entities?
- Does this approach provide any tangible benefits?
- Local manufacturing – Are there favored partners for local manufacturing?
- How prevalent is parallel importation in {{CountryName}}?
- Any sense on price vs volume elasticity?
- What are the typical pricing strategies adopted in the market? Any thresholds that need to be kept in mind?
- Are there any patient advocates being utilized?
- How is your operations structured in {{CountryName}}? Do you distribute directly or through a partner? Do you have a master distributor or smaller entities to cover the entire country?
- What is your company doing to improve market access for key drugs such as ((drug name}})?
Do you feel that your company has enough resources on-the- ground to achieve this?

SECTION C - SALES ORGANIZATION

- How many employees are dedicated towards solid tumors (4 tumor types)? Are there tumor types-specific teams?
- What are the team structures like? Do you have dedicated sales reps, MSLs, product managers, etc. for each tumor type?
- Please share details on the roles & responsibilities of these team members
- What is the number of sales reps, SOV, number of MSLs, for each tumor type?
- What is the digital footprint of your company?? What are some of the digital strategies being employed by competitors?

SECTION D - PRICING AND REIMBURSEMENT STRATEGY

- Our research suggests that there is no reimbursement for PD1s in Turkey except for Opdivo. So, getting a drug on the reimbursement list is very challenging. What are your thoughts?
- Burden of disease such as NSCLC is huge in Turkey and yet the SSI has been very reluctant in approving reimbursement. What are the key reasons for that?
- How was AstraZeneca able to get Durvalumab on the NPP list? What was their access strategy?
- What tactics have companies used in the past or are using to get their drugs on the reimbursement list? Please share case examples, if relevant.
- From our conversations with HCPs, what we have found is pricing plays a very important role in markets like {{Country Name}} - so, what are the typical pricing strategies adopted

by key players in the market?

- What is the level of discounting offered? Do companies follow tiered pricing? If yes, what do they look like and how does it work?
- What is the present landscape for companion diagnostics? How are companies leveraging this?
- What is the overall strategy here? Are drug companies paying for them? What is the view of your company with regards to companion diagnostics?
- Are there examples of government partnerships with drug company, i.e., special local government-sponsored activities for promoting drugs in the solid tumor space?
- Are you aware of any immunologic or biologic agents impacted by Loss of Eligibility?

RESULTS:

The insights gained during this study were particularly regarding the market landscape for solid tumors and solid tumor medications, the expansion of the solid tumor market, the regional and worldwide competitive landscape, and the important client categories for the four cancer types.

As a non-disclosure agreement was signed by us with our company, we cannot reveal the entire transcript in this report. Following are the first and last page screenshot of the transcript:

SECTION A – MARKET LANDSCAPE (FOCUS ON NSCLC, ESOPHAGEAL CANCER, HEPATOCELLULAR CARCINOMA, AND GASTRIC CANCER)	
Q1	At a very high level, what does the market landscape for solid tumors look like today?
A	Breast cancer, lung cancer, esophageal cancer, gastric cancer, thyroid cancer, and HCC are all on the rise in my country, with more than 60% of patients being admitted to the hospital at an advanced stage. As a result, the oncology medicine market will grow since there will be more demand for drugs as the number of cancer cases rises. Pfizer, MSD AstraZeneca, and Novartis are the three biggest pharmaceutical companies in Saudi Arabia because there is so much competition, the manufacturer's major goal is to develop more and more medications with therapeutic benefits. Further, private facilities are the primary customers for this because they are primarily purchasing novel cancer-treatment approaches.
Q2	How big is the solid tumor treatment market - in terms of value?
	Are you able to share an approximate breakdown of the market by the four tumor types - NSCLC, Esophageal cancer, Hepatocellular carcinoma, and Gastric cancer?
A	Lung cancer, HCC, esophageal cancer, and gastric cancer are the most common cancers in my region, so their market value will be higher. It is around SAR 5-10 billion dollars.

Figure 10- Screenshot of first page of the solid tumors market assessment transcript

INTERVIEW GUIDE	
MENA Solid Tumors – Landscape Assessment	
A	Companion diagnostics are now becoming increasingly popular in Saudi Arabia. It will help in determining the best course of treatment for a cancer patient. For example, if a physician needs to determine the therapy for a cancer patient, this diagnostic procedure will assist in determining which treatment the patient will respond to. Companies are willing to adopt these technologies since they will help to minimize undesirable effects for patients while also allowing physicians to identify a treatment choice more quickly. Probe: What is the overall strategy? Are drug companies paying for them? Response: Companies who have their own companion diagnostic procedure pay for them, and if they partner with other company, the partner pays a portion of the cost. Probe: What is the view of your company with regards to companion diagnostics? Response: We have developed our own companion diagnostic tool, Ventana ALK (D5F3) CDx Assay and it is specifically for SCLC. This diagnostic tool will help to speed up treatment decisions for NSCLC patients and improve the treatment option because it finds the right treatment.
Q44	Are there examples of government partnerships with drug company, i.e., special local government-sponsored activities for promoting drugs in the solid tumor space?
A	Our company has partnered with Saudi Arabia's Ministry of Interior so that there will be improvement and development of the medical facilities in the country.
Q45	Are you aware of any immunologic or biologic agents impacted by Loss of Eligibility? Do you have insights into the patent landscape around these agents or tumor types?
A	

Figure 11- Screenshot of the last page of the solid tumors market assessment transcript

CONCLUSION:

FOR EGYPT: In this project, we get to know that when a patient exhibits symptoms such as fatigue, lumps or maybe changes in their bowel habits, the diagnostic process begins when patients visit the doctor, the doctor will order tests such as a CBC test, an X-ray, and an MRI. If the patient has cancer, the general doctor or specialists like pulmonologists or a gastroenterologist will refer the patient to an oncologist. When the patient is referred to the doctors, they will perform tests such as MRI, CT scans, and PET scans, as well as an endoscopy or biopsy. For NSCLC, doctors will perform tests such as chest X-rays, MRI, CT scans, and a bronchoscopy or biopsy. They will use MRI, CT scan, or PET scan to diagnose gastric cancer, esophageal cancer, and hepatocellular cancer. They will also perform an endoscopy or biopsy. The entire procedure will take more than three weeks. The number of patients in public facilities is high because diagnostic equipment is limited in comparison to the number of patients. As a result, the diagnosis is delayed. Doctors have to wait for the diagnosis, whereas in a private facility, the patient number is lower, and they do not have to wait for the diagnosis; they can begin their diagnosis within one or two days. Most of the diagnostic tests are covered by public insurance, the only difference is in the public hospitals the waiting time is more while patients with Egyptian private health insurance have access to the premium hospitals where the facility offers high-quality care for diagnosis and treatment and therefore, the time taken is also less. The average treatment duration is six months to one to two years for solid tumor patients. Doctors give chemotherapy as the therapy cycle can last 3 to 4 weeks, whereas immunotherapy is given every 3 to 6 weeks and can last up to two years if the tumor is in an advanced stage of lung cancer, Moreover, they administer three cycles of chemotherapy and immunotherapy every 2 to 3 weeks for gastric cancer. For esophageal cancer and hepatocellular carcinoma, we administer immunotherapy every 3 to 4 weeks. The number of cycles will depend on the condition of the patient and how well the patient is responding to the treatment. If the patient is in a later stage, the average treatment duration will be nearly couple of years. If it is all in the early stage, the average treatment duration will be six months. In the early stages, we can perform surgery to remove the tumor, followed by immunotherapy or chemotherapy, but in the advanced stages, we must treat the patient with immunotherapy, neo-adjuvant therapy, targeted therapy, or chemotherapy. The current landscape of companion diagnosis is better as in Egypt the companion diagnostic test is easily available as the test helps in determining the genomic profile of the tumor that helps

in the selection of the immunotherapy drugs for the treatment. The major players in the market are Merck, Roche and AstraZeneca. The main drug regulatory body in Egypt is the Egyptian Drug Authority that is solely responsible for overseeing the complete process from application to finalization and addition of the drug. The process is pretty extensive and bounded. It starts off with an appeal to the Central Administration of Pharmaceutical Affairs who then provides a suitable time and date for the applicant's submission within 3 working days. Once the application is put in, there are various committees like the pricing committee, technical committee, stability committee, inspection committee, and various others that the company has to pass through before receiving an approval for their drug. The company has to send a request to the CAPA by an email and within 3 working days they would revert back with a date and time for the form submission. The processing of the form will take around 15 days. After getting accepted, the technical committee will review the file to check for novel effective substances. After receiving the preliminary approval within 30 days the candidate has to apply to the Pricing committee, who will revert back within 2 months. Within 60 days the Stability committee will review the file and stability examination will be performed. Then the Naming committee will then provide an approval for the drug's name. The drug is then given a preliminary approval in the Inspection committee that remains valid for 3 years. They then get analyzed by the NODCAR and the bioequivalence committee. The final approval remains valid for a duration of 10 years.

FOR ISREAL: In this project, we get to know that the typical time for the diagnosis of solid tumors is more than a month. And there are various tests performed to diagnose solid tumors. They are blood count and liver function tests, followed by a CT scan, endoscopy, or bioscopy, as well as ultrasound tests for gastric and esophageal cancer. In the case of esophageal cancer, a tracheobronchoscopy is also performed if the tumor is located above the tracheal bifurcation. For hepatocellular carcinoma, a liver function test is performed, followed by an MRI or CT scan of the chest and abdomen, and finally, a biopsy. For lung cancer, an X-ray and CT scan are performed, followed by bronchoscopy or biopsy. Some of the most commonly used drugs used are Trastuzumab, Sorafenib and Pembrolizumab. According to the HCPs, in a public hospital, it can take more than a month to get a diagnosis, whereas, in a private hospital, it can take less than a week. Private hospitals have more staff to attend to the patients, and diagnostic instruments are more easily accessible because the number of patients is low, so the diagnostic process is much faster. The treatment time for solid tumors are also different like it primarily depends on the stage of cancer; for example,

early-stage cancer treatment lasts a few months, such as 3 to 6 months. Patients typically live longer lives because the progression is detected at an early stage. Doctors give immunotherapy to advanced-stage cancer patients until the cancer stops progressing. Treatment lasts for one to two years with immunotherapy or chemotherapy. There are different health coverage policies that are offered by the private companies and government for the treatment of solid tumors. The treatment pathway for gastric, hepatocellular cancer and esophageal cancer would be Keytruda, or Pembrolizumab for the advanced stage. Most patients after the surgery will receive adjuvant chemotherapy. Trastuzumab is also given in combination with Cisplatin or Capecitabine, if there is the expression of HER2 then trastuzumab is given in the targeted therapy. The treatment pathway for lung cancer would be also Keytruda and Nivolumab as the first-line therapy. Ipilimumab is also given as a first-line therapy. Also, the companion diagnostic is currently done majorly for lung and breast cancer as the prevalence of these cancers is high. The test ensures that the patient will respond to the drug, decrease the progression, and will increase the survival chances of the patient. Merck, BMS are some of the major players who are currently operating in the country. The process begins with an application that is to be filed with the MOH Drug Registration Department. During the application the applicant must provide a quality control certificate for the pharmaceutical product, attesting to its suitability for medical usage. This certificate can be obtained from the Files Assessment Department of the Institute for Standardization and Control of Pharmaceuticals at the Pharmaceutical Division. As for the market approval, the Pharmaceutical Control Section of the Pharmaceutical Division, as well as the Institute for Standardization and Control of Pharmaceuticals, must be contacted for the marketing permission of the first batch of the registered product. The manufacturer must also submit a list detailing the medical preparation to the Israeli Drug Registry, which must include evidence proving the preparation's safety, efficacy, and quality as these are the requirements for the successful evaluation of any therapeutic drug. There are a couple of sub-committees that are responsible for the regulation of drugs in the country. The first body is known as the Institute for Standardization and Control of Pharmaceuticals which is involved in checking the quality of the product. Next is the Preparations Registration Department that deals with the registration of the new drugs, the Import of Pharmaceuticals and Drugs Department is responsible for looking after the import of the drugs. Then comes the Pharmaceutical Monitoring Section which primarily approves the drug's packaging. The Pharmacovigilance and Drug Information Department oversees the safety profile for the drug.

FOR LEBANON: In Lebanon, we get to know that the cancer diagnosis will take approximately 3-4 weeks. The process begins with a simple cancer screening, during which the doctor checks for a tumor in the body. After that, imaging tests are used to identify the severity of the malignancy. MRI, CT scan, X-ray, and PET scan are among the tests available. All four forms of solid tumors are subjected to these imaging studies. A biopsy is also performed for diagnostic purposes to determine the extent of cancer, such as how far it has spread to other areas of the body. For Gastric Cancer, upper endoscopy and laparoscopy are done. For Lung Cancer, Sputum Cytology is done. Serum AFP is used for HCC. And for esophageal cancer, Bronchoscopy is done. When a patient visits a private hospital, the process takes less time because they do not have to wait in long lines to receive a diagnosis; however, when a patient visits a public hospital, the process takes longer because the patient must first complete all the formalities, such as the appointment form. Then, they will begin their diagnostic process after receiving the appointment. So, here insurance does play a role in deciding the diagnosis and treatment for the patient but overall, the duration remains the same. There is no insurance coverage as in the case of public sector however, in the private insurance do offer certain amount of coverage to the patients depending on his plan. The average treatment duration of solid tumor patients is around one year. Different treatment options are used; therefore, the length of treatment duration will vary. For hepatocellular carcinoma, chemotherapy and targeted therapy are used, and it takes about 6-7 months. In the event of lung cancer, adjuvant therapy is performed, which takes 3- 4 months. Chemotherapy is being used for the other two indications, and it will take 6-7 months to complete. In the case of HCC, surgery is performed at an earlier stage, and if the patient is in the advanced stage, targeted or immunotherapy is administered. In the advanced stages of lung cancer, we use pharmacological therapy, which includes chemotherapy, immunotherapy, and targeted therapy. Chemotherapy is used to treat esophageal cancer. Surgery is used to treat stomach cancer in its early stages, and immunotherapy is used to treat stomach cancer in its advanced stages. BMS, AstraZeneca, MSD, Roche and Pfizer are the market players in Lebanon. The entire regulatory process in Lebanon for drugs is regulated by the Ministry of Public Health. Most medicines in Lebanon are imported, and hardly 7-10% of the medicines are manufactured in local premises. Firstly, if a drug is to achieve approval, it should be safe, along with it, its pricing should also be fair. A product must be registered under the name used in the country of origin. Also, no expedited process exists for the approval of novel chemical entities. With regards to the entire review process, it is performed by the Drug Technical Committee. After evaluating the supplied documentation, the drug samples are

examined in a laboratory, and the drug can be approved based on the results. The entire registration process takes around 2 years. If the required conditions are met, the Drug Registration Technical Committee of the Ministry of Health will usually spend three months revising the drug files.

FOR TURKEY: The treatment duration really depends on the stage of the cancer and the tumor type. So, for example, if NSCLC is at stage 1 and stage 2, then surgery is recommended and following surgery, chemotherapy might also be suggested to remove any tumor remnants. The entire treatment would last for 1-2 months, but if the cancer is at an advanced stage, then chemotherapy or immunotherapy might be recommended. These treatments usually last from 3-6 months depending on the tumor size and patient's response to the therapy. For esophageal cancer, in early stages, when the tumor is resectable, esophagectomy is recommended and for non-resectable tumors we usually recommend chemotherapy or chemoradiotherapy. In gastric cancer, gastrectomy is performed in earlier stages and palliative chemotherapy is provided for metastatic stages. Then, in hepatocellular carcinoma, in patients with early-stage cancer, surgical resection is performed. The diagnostic process will take approximately 1-1.5 weeks, and in severe cases, it will take two weeks. If you have any signs, the doctor will take down your personal and family health history as well as do a medical examination. Following that, the doctor will advise you to undergo diagnostic testing such as imaging scans or other tests, as there is no single test that can detect cancer. The tests are Cancer Blood Tests, PET Scans, MRI, X-ray, CT scans. There are various tests used to detect esophageal cancer, such as the Barium swallow. Basically, the patient is given a fluid containing barium to swallow, after which X-rays are taken. If the doctor identifies an unusual growth or malignancy, he will advise the patient to undergo a biopsy and an upper endoscopy. A bronchoscopy is also carried out. Laparoscopy and biopsy are both used to diagnose HCC. The diagnosis of NSCLC is done using sputum cytology and bone imaging. Finally, for gastric cancer, endoscopic ultrasound is used to determine how far the condition has progressed throughout the body. The drug for immunotherapy available at our facility is Keytruda, pembrolizumab. Merck, Roche and BMS are the market players for solid tumors in the country. For therapies and drugs, there is a strict regulatory policy in place. The Turkish Medicines and Medical Devices Agency has developed a number of rules and regulations for drug and therapy market authorization in Turkey. According to the regulations, the entire process of obtaining market authorization should not take more than a year; however, there are delays due to regulatory issues such as non-compliance with certain rules, and it may take

up to two years for the companies to obtain market authorization. The brands must first apply for registration and complete the pre-application procedure, after which the application is validated and approved for review. This would normally take between 15 and 18 days. Following this, the application and the drug or therapy would be evaluated scientifically, with the safety, efficacy, and quality of the drug and therapy being reviewed. The entire process would take 5 to 7 months. Following the approval and opinion of the scientific committee, the next step in prescription medicine would be a review by the advisory committee. The reports received from the scientific committee are evaluated here, and final approval is granted. According to the law, the total duration for the whole approval procedure should be around 210 days, but timelines are usually extended.

FOR SOUTH AFRICA: For lung cancer diagnosis, we will do a thoracic X-ray, CT or PET scan or MRI or CT guided needle biopsy, thoracentesis, bronchoscopy, or thoracoscopy and for esophageal cancer diagnosis, doctors will do an endoscopic ultrasound or an endoscopy with biopsy, they will also do a CT or PET scan. For gastric cancer diagnosis, they will again do a CT or PET scan then they will do an MRI or endoscopic ultrasound, laparoscopy, or biopsy. For Hepatocellular carcinoma, doctors will do an abdominal ultrasound with AFP (alfa- fetoprotein), bilirubin test, CT scan, or PET scan, and they will perform a liver biopsy. It usually varies as each patient has a different type of tumor profile for example, for advanced non-small cell lung cancer the immunotherapy treatment 30-minute infusion every 3 to 6 weeks or 4 to 6 cycles of chemotherapy is given for non-small cell lung cancer whereas for gastric cancer 3 to 4 cycles of chemotherapy. For esophageal and hepatocellular carcinoma, immunotherapy is given every four weeks. If the cancer patient is in the initial stage, then the treatment duration would be 3 to 6 months, and if the cancer patient is in the advanced stage, the treatment will continue until the progression stops. Keytruda, Bevacizumab or Pembrolizumab and erlotinib. MSD, Roche, AstraZeneca, and BMS are the market players for solid tumors in the country. The South African Health Products Regulatory Authority, or SAHPRA, is in charge of all pharmaceutical regulations and requirements. Medicines in South Africa are regulated by the agency, which is governed by the Medicine Act. The regulatory approval processes are typically slow; the average approval time for these agents is close to 2 years if it is prioritized and fast tracked. The applications which are fast tracked are taken on priority for scientific review and approval. If it is not fast tracked, then the approval process may take close to 4 years. This is the typical timeline for all the new drugs launching in the country.

FOR UAE- The patients usually visit a general practitioner or a specialist depending on the symptoms he has observed. Based on the initial screening of his health conditions and medical history, these doctors may recommend certain basic tests like MRI, Xray or a CT scan. If they do suspect any tumorous growth, they further will refer the case or patient to an oncologist. Here, further tests like a biopsy or an endoscopy might be recommended in order to have confirmation of the tumor stage and prognosis of the cancer. Overall, the complete process may take place anywhere between 3-4 weeks of time. Doctors give pembrolizumab as first-line therapy for NSCLC patients who have PDL1 activity more than 50% while for NSCLC patients who show activity less than 50%, we give atezolizumab and bevacizumab with carboplatin and paclitaxel. The main players are Roche, after that is MSD, AstraZeneca, Novartis. The regulatory process will differ from one country to the next. The government's primary goal is to protect the public's health. As a result, pharmaceutical businesses must adhere to a regulatory process. The Ministry of Health oversees the entire procedure. When a manufacturer wants to market its pharmaceuticals, they must submit an application that includes all of the company's information as well as product information such as Dosage, Benefits, Clinical Trial Results, and Price Details. The drug regulatory body then reviews the clinical trial results to ensure that the product has been tested and is of good quality and safe for the patient. They simply want to ensure that the information provided by the manufacturer is correct. After this process, the Licensing Committee must then approve market authorization, which includes licensing. The pricing committee will next decide on the drug's price, which will be approved by the MOH.

PROJECT 2: ORAL NUTRITION SUPPLEMENTS

AIM- To better understand the prevalence of Oral Nutrition Supplements and Diabetic Nutrition Supplements in Singapore and Malaysia.

THEORY- In this research study, the client wants to understand the Oral Nutrition Supplements and Diabetic Nutrition Supplements that are commonly recommended and prescribed by General Practitioners, Dieticians, General surgeons, Endocrinologists, Physician Internal Medicine, and Pediatrician. The purpose of this study was not to sell or promote anything but rather to understand the respondent's views.

Oral nutritional supplements (ONS) are sterile liquids, semi-solids, or powders that include macro and micronutrients. Individuals who are unable to achieve their nutritional needs through oral food alone are commonly treated with them in acute and community healthcare settings. The nutritional representatives from Abbott, Nestle, Fresenius Kabi, Fonterra, Kotra Pharma, Hexagon Nutrition, Danone Nutricia, Kabel International, and Wyeth are mostly visiting the HCPs. There are various nutritional supplements that are used by the HCPs and they are recommending/ prescribing the supplements for the following conditions General/ Standard Nutrition, Diabetes Nutrition, Nutrition for Chronic Renal Disease, and Nutrition for Cancer Patients.

FOR GENERAL/ STANDARD NUTRITION-

BOOST ISOCAL LIQUID
BOOST OPTIMUM
ENSURE LIFE HMB
ENSURE GOLD LIQUID (previously ENSURE NUTRITION SHAKE)
ENSURE PLUS
ENSURE PLUS ADVANCE HMB
ENSURE REGULAR (LIQUID)
ENSURE REGULAR (POWDER)

ENSURE OTHERS (COMPACT, NUTRIVIGOR, ENSURE TWOCAL, ENSURE MAX PROTEIN)
FRESUBIN PROTEIN ENERGY 1.5KCAL
FRESUBIN 2.0KCAL
RESOURCE 2.0
WYETH ENERCAL
NUTRICIA FORTISIP

FOR DIABETES NUTRITION-

DIBEN
GLUCERNA LIQUID
GLUCERNA TRIPLE CARE
NUTREN DIABETES
GLUCERNA 1.5KCAL LIQUID

FOR SPECIALIST OR THERAPEUTIC NUTRITION-

FRESUBIN RENAL
NESTLE IMPACT
JEVITY
NEPRO HP
NEPRO LP
NOVASOURCE RENAL
NUTRICIA SOUVENAIID
PEPTAMEN
PROSURE
PULMOCARE
SUPPORTAN
NESTLE OPTIFAST
NESTLE ARGINAID

FEATURES OF GENERAL/ STANDARD NUTRITION

- The products contain HMB and protein that can help individuals to gain strength and muscle mass for better health outcomes.
- These products help the patient to get rid of illness and after surgery, help the children or adults to boost energy.
- The product enhances functional results in older persons who have recently been discharged and community-dwelling older adults.

RESULTS:

S1. Doctor, just to verify, may I know your field of specialization? (SA)

- General Surgeon
- Physician (IM)
- Endocrinologist
- Dieticians
- General Practitioner
- Others (please specify)

NEXT

POSTPONE HELP COOKIES

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S11b. Which of the following Oral Nutrition Supplements did you regularly recommend/ given advice in the past 3 months? (MA)

- General/ standard nutrition
- Diabetes nutritional supplement
- Nutrition for chronic renal disease
- Nutrition for cancer patients
- Others, please specify:

NEXT

POSTPONE HELP COOKIES

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S11c. Thinking about **past 3 months**, please could you tell me from which companies you have seen/ contacted nutritional representatives on the subject of Oral Nutrition Supplements either face to face or via digital channels (phone call/ text/chat/ video call/ email, etc.)? (MA)

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S11d. Have you been engaged by nutritional representatives from below companies in the **past 3 months** either via face to face or via digital channels (phone call/ text/chat/ video call/ email, etc.?(MA)

- Fonterra
- Kotra Pharma
- Nestle
- Wyeth
- Hexagon Nutrition
- MediKAL Nutrice (Kabel International)
- Fresenius Kabi
- Reckitt Benckiser
- None

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Q10. Of all the recommendations you have made in the last 3 months for **GENERAL/ STANDARD NUTRITION**, what percentage are for each of the following Oral Nutrition Supplements brands?

Anlene Gold %
 Nutren Optimum %
 Enercal plus %
 Ensure Gold %
 Total %

NEXT

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Q10. Of all the recommendations you have made in the last 3 months for **DIABETES NUTRITIONAL SUPPLEMENT**, what percentage are for each of the following Oral Nutrition Supplements brands?

Glucerna %
 Total %

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Q23b. Thinking about the companies which currently detail to you, which channels do they use to communicate with you about Oral Nutritional Supplement products? Please select all the channels experienced by you for each of these companies. **(MA PER COMPANY)**

	Abbott	Nestle
Email	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Congress / Symposium	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Interaction/detailing video call (Whatsapp, Wechat, Skype, Zoom, WebEx, etc.)	<input type="checkbox"/>	<input type="checkbox"/>
Interaction/detailing via Whatsapp/ Wechat/ Facebook messenger, Telegram, etc.)	<input type="checkbox"/>	<input type="checkbox"/>
Interaction/detailing via remote detailing platforms	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Webinars	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Telephone/ phone call	<input type="checkbox"/>	<input type="checkbox"/>
Face-to-face meeting with medical sales representative	<input type="checkbox"/>	<input type="checkbox"/>
Company website	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Coffee / Café Talk	<input type="checkbox"/>	<input type="checkbox"/>
SMS	<input type="checkbox"/>	<input type="checkbox"/>
CME	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Roundtable discussions	<input type="checkbox"/>	<input type="checkbox"/>
Online Chat Groups (FB Messenger Groups, Viber Groups, etc.) with HCPs created by companies	<input type="checkbox"/>	<input type="checkbox"/>
Others (specify)	<input type="text"/>	<input type="text"/>

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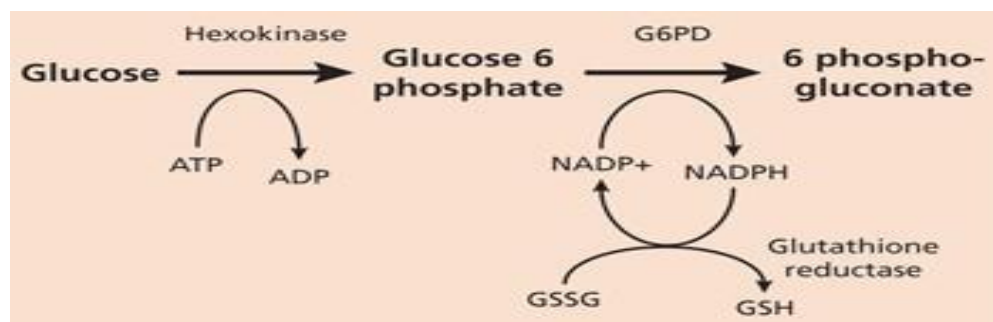
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Attivata Windows

PROJECT 3: Prevalence and Testing of Glucose-6-Phosphate Dehydrogenase Deficiency in Indonesia and Vietnam.

AIM- To better understand the knowledge, perception, prevalence, and practice around the G6PD testing among healthcare providers who work in the private sector.

Theory- More than 400 million people worldwide suffer from glucose-6-phosphate dehydrogenase deficiency, one of the most prevalent X-linked hereditary blood disorders. When exposed to specific diseases and medications, or when consuming specific foods like fava beans, people who are G6PD deficient can have severe newborn jaundice and acute hemolytic anemia. Red blood cells, which transport oxygen from the lungs to organs all over the body, are impacted by a hereditary condition called G6PD Deficiency. RBCs prematurely degrade in affected people due to a deficiency in an enzyme called glucose-6-phosphate dehydrogenase. So, this whole process that helps in the destruction of RBCs is called hemolysis.



CAUSES OF G6PD DEFICIENCY- Well, this deficiency results when there is a mutation in the G6PD gene. Instructions for generating the enzyme G6PD are provided by this gene. The regular digestion of carbohydrates involves this enzyme. Additionally, it shields RBCs against reactive oxygen species, which are byproducts of regular biological processes and have the potential to be hazardous chemicals. Compounds that are created during chemical processes involving G6PD stop reactive oxygen species from accumulating to dangerous quantities within RBCs. G6PD can no longer function as a protective enzyme if mutations in the G6PD gene cause a decrease in the enzyme's production or a change in its structural makeup. Reactive oxygen species levels can rise as a result of factors including infections,

particular medications, or eating fava beans, which causes the body to lose red blood cells more quickly than it can make new ones. Hemolytic anemia's symptoms and indicators are caused by a decrease in red blood cells.

INHERITANCE OF G6PD DEFICIENCY- X-linked inheritance governs glucose-6-phosphate dehydrogenase inheritance. If the disorder-causing gene is found on the X chromosome, one of each cell's two sex chromosomes, the condition is said to be X-linked. In females, XX chromosomes are present while males only have one X chromosome is present. Fathers are unable to pass on X-linked qualities to their sons, which is a trait of X-linked inheritance. One mutated copy of the G6PD gene in each cell can result in less severe aspects of the illness or even no indications or symptoms in females, who have two copies of the X chromosome. However, due to the X chromosome's normal copy of the G6PD gene being switched off through a process known as X-inactivation, many females with one mutated copy of this gene experience glucose-6-phosphate dehydrogenase insufficiency comparable to that seen by affected males. One of the two X chromosomes is irreversibly inactivated in somatic cells early in female embryonic development (cells other than egg and sperm cells). Similar to males, girls have just one active copy of the X chromosome in each body cell thanks to X-inactivation. X-inactivation typically happens at random, leaving each X chromosome active in roughly half of all body cells. One X chromosome may occasionally be active in more than 50% of cells because X-inactivation is not always random. Skewed X-inactivation refers to X-inactivation that is not random in nature. According to research, females with G6PD deficiency caused by abnormalities in the G6PD gene frequently have skewed X-inactivation, which makes the X chromosome carrying the normal copy of the G6PD gene inactive in the majority of the body's cells. The chromosome with the altered G6PD gene is expressed in more than half of the cells as a result of this skewed X-inactivation. Hemolytic anemia and other symptoms of glucose-6-phosphate dehydrogenase deficiency come from the insufficient production of normal G6PD enzymes.

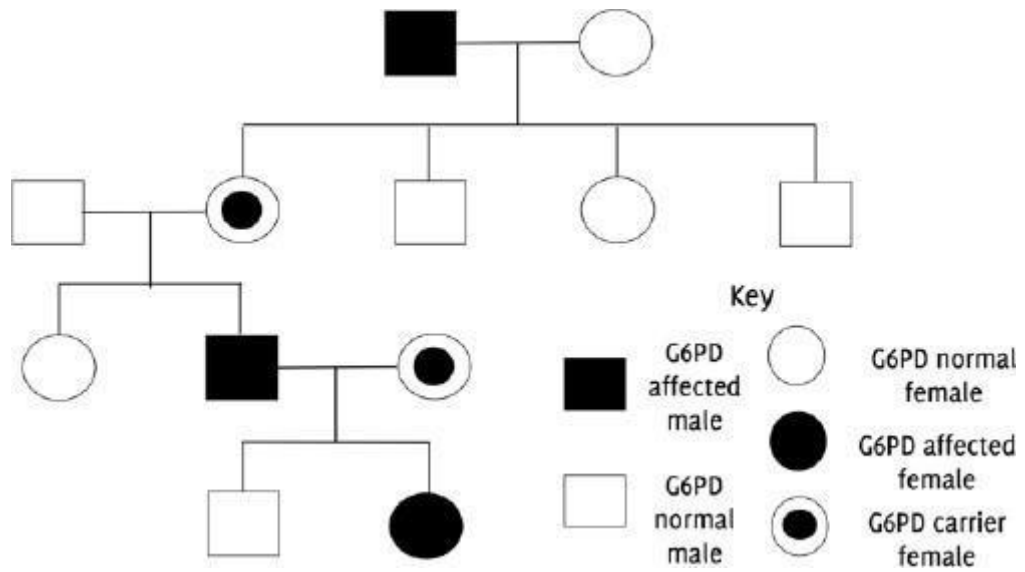
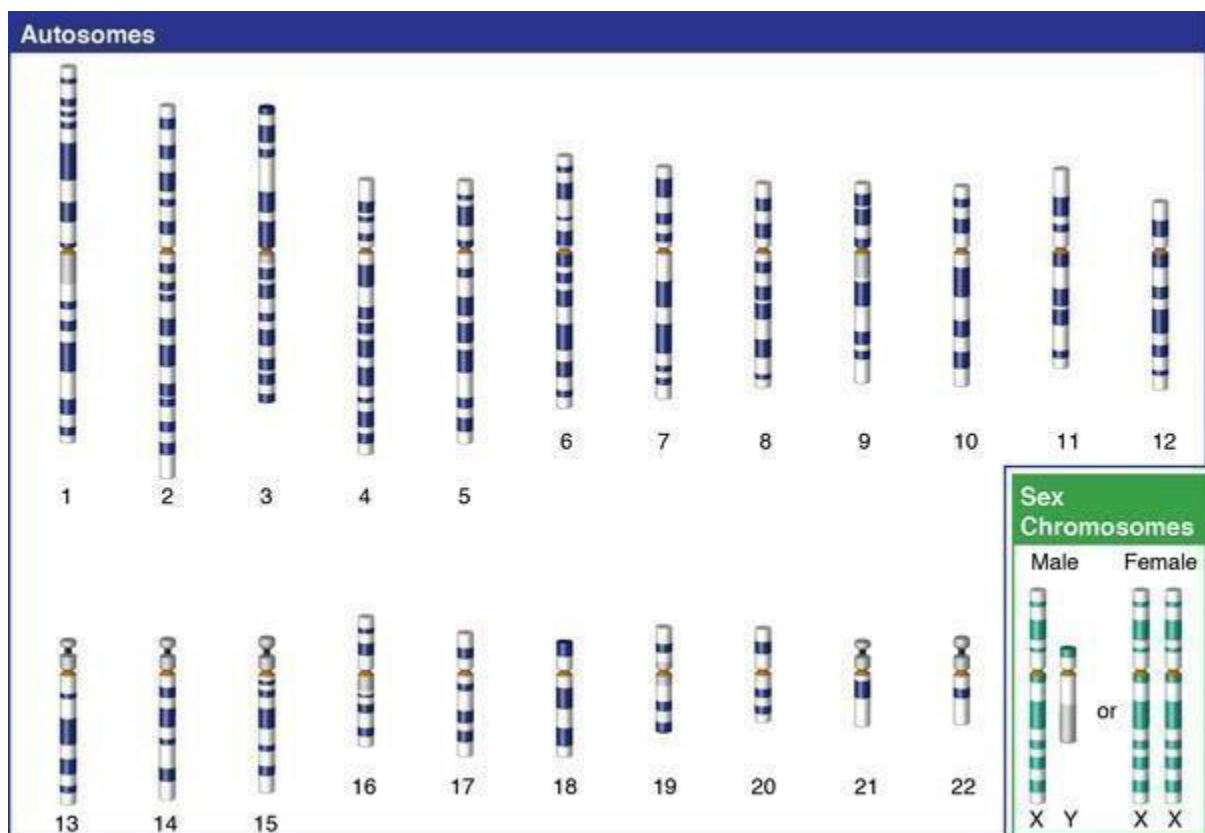
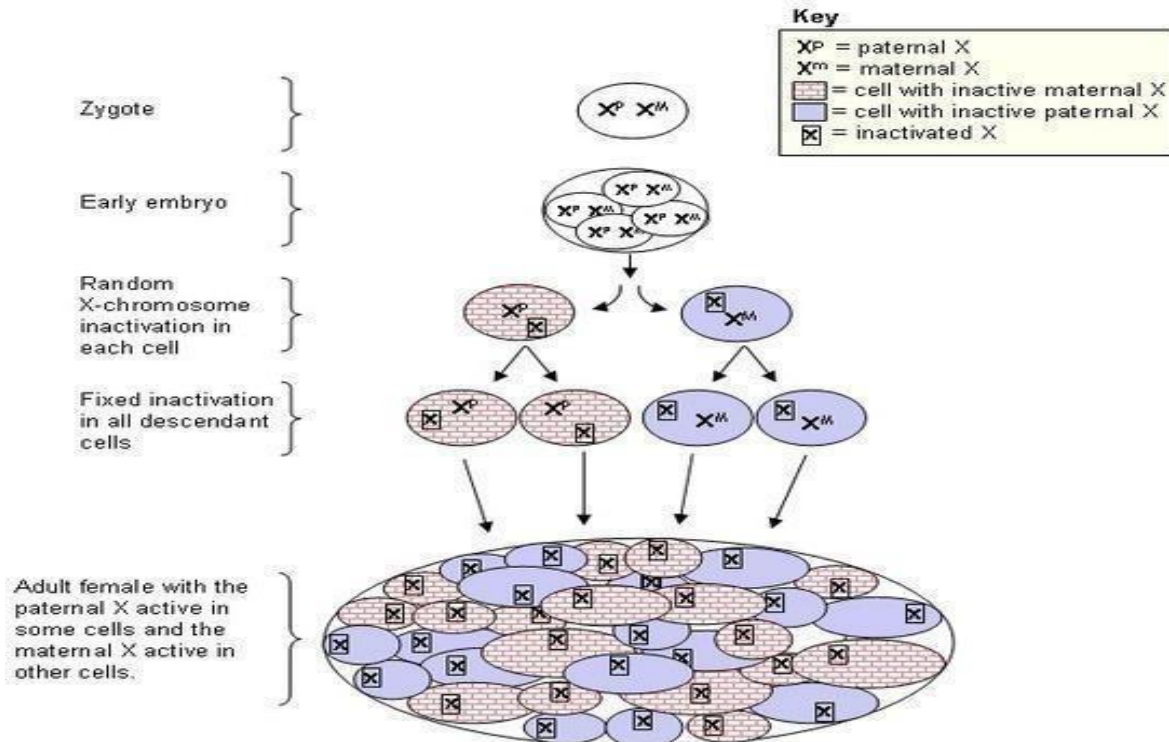


Figure 12- X-linked inheritance pattern of G6PD deficiency.





TESTING FOR G6PD DEFICIENCY- A quick fluorescent spot test that looks for the formation of NADPH from NADP or a quantitative spectrophotometric analysis are both used to diagnose G6PD deficiency. If the blood spot does not fluoresce under UV light, the test is positive. Other tests have been employed in field research where rapid screening of a large number of patients is required; however, they need follow-up testing to confirm an aberrant result. Polymerase chain reaction-based tests are used for prenatal diagnosis, family research, and population screening to discover specific mutations.

ACUTE HEMOLYSIS- Infection, consumption of fava beans or exposure to an oxidative medication are the three main causes of acute hemolysis. Following are the drug precautions for people with G6PD deficiency.

MEDICATIONS	USE OF THE MEDICATION
DAPSONE	Antimicrobial for the treatment of leprosy.
PRIMAQUINE	Antimalaria Agent
FLUTAMIDE	Antiandrogen for treatment of prostate cancer.
NALIDIXIC ACID	Antibiotics are used primarily for urinary tract infections.

RESULTS:

The insights gained during this study were particularly regarding the market landscape for G6PD Testing, the prevalence of G6PD Testing, and various tests that are used to detect G6PD at hospitals.

As a non-disclosure agreement was signed by us with our company, we cannot reveal the entire transcript in this report. Following are some screenshots of the transcript.

Q1	What is your primary medical specialty?	
A	Please highlight the applicable specialty	
	Hematologist	General Physician
	Pediatricians/Neonatologist	Other (please specify)
Q2	How many years of service have you had in the healthcare sector, post-professional qualification?	
A	6 years	
Q3	Which of the following best describes your primary practice setting? [RECRUIT A MIX]	
A	Please highlight the applicable practice	
	Major Academic Medical Center	Affiliated Teaching Hospital
	Private Practice (solo or group) in which I have no ownership stake	Private Practice (solo or group) of which I am a full or partial owner
	Community Hospital	
	Note: Please use the country-specific names prevalent for the type of practices described above. For instance, if the community hospitals are known by some other name in either of the country then use that particular name	
Q4	Which state/district do you primarily work in?	
A	East Jakarta	

SECTION A – KNOWLEDGE							
Q1	Please tell us about the status of G6PD deficiency in your country.						
	Note: Respondent is expected to discuss: <ol style="list-style-type: none"> The prevalence of G6PD deficiency in his/her country What are the causes of G6PD deficiency and why it is important to identify G6PD status of the population? Is it more prevalent in males or in females? What is the regional variation in G6PD deficiency in his/her country? Which regions are most affected and why? 						
A	<table border="1"> <tr> <td>Prevalence of G6PD deficiency?</td> <td>In our country, the number of patients suffering from G6PD is very less if compared with other diseases. I have not seen many people who are affected with this disease. Probe: What is the prevalence of G6PD in Indonesia? Response: It's very low because this disease is rare. Probe: Can you mention the prevalence in terms of percentage please? Response: I do not know specifically.</td> </tr> <tr> <td>Causes of G6PD deficiency?</td> <td>It is a hereditary disease. In this condition, the X chromosomes get affected and affect the process of synthetization of G6PD enzyme.</td> </tr> <tr> <td>Importance of identifying G6PD status</td> <td>I think it is beneficial for the patient to be aware of this condition in order to maintain the safety. If the patient will be familiar with this disease, then he can take the appropriate actions to be alright. This condition can be affected by some medicines like certain anti-malarial</td> </tr> </table>	Prevalence of G6PD deficiency?	In our country, the number of patients suffering from G6PD is very less if compared with other diseases. I have not seen many people who are affected with this disease. Probe: What is the prevalence of G6PD in Indonesia? Response: It's very low because this disease is rare. Probe: Can you mention the prevalence in terms of percentage please? Response: I do not know specifically.	Causes of G6PD deficiency?	It is a hereditary disease. In this condition, the X chromosomes get affected and affect the process of synthetization of G6PD enzyme.	Importance of identifying G6PD status	I think it is beneficial for the patient to be aware of this condition in order to maintain the safety. If the patient will be familiar with this disease, then he can take the appropriate actions to be alright. This condition can be affected by some medicines like certain anti-malarial
Prevalence of G6PD deficiency?	In our country, the number of patients suffering from G6PD is very less if compared with other diseases. I have not seen many people who are affected with this disease. Probe: What is the prevalence of G6PD in Indonesia? Response: It's very low because this disease is rare. Probe: Can you mention the prevalence in terms of percentage please? Response: I do not know specifically.						
Causes of G6PD deficiency?	It is a hereditary disease. In this condition, the X chromosomes get affected and affect the process of synthetization of G6PD enzyme.						
Importance of identifying G6PD status	I think it is beneficial for the patient to be aware of this condition in order to maintain the safety. If the patient will be familiar with this disease, then he can take the appropriate actions to be alright. This condition can be affected by some medicines like certain anti-malarial						

Q3	In general, in what scenarios is a G6PD test used in your country?
A	<p>So, if the patient is suffering from malaria, then I perform the testing. Probe: Can you mention other scenarios other than malaria? Response: Patient complaining about weakness for a sustainable <u>period of time</u> along with pale yellow skin which is a feature of jaundice then also I recommend the G6PD testing to the patient.</p>
Q4	<p>Which of the test (Beutler Test (fluorescent spot test or Spectrophotometric Analysis or Any Other Test (please name)) do you think is most appropriate for your country? Why?</p> <p>Which of the above-mentioned tests do you think <u>most commonly used</u>?</p> <ol style="list-style-type: none"> At which level of health facilities if these G6PD tests most frequently use? Are these tests used as screening tests that require confirmatory tests? Or are these tests used for diagnostic tests that do not require confirmatory tests? If they are used as screening test, what tests are used as confirmatory tests?
A	<p>It is called G6PD test, I am not aware of the test name.</p> <ol style="list-style-type: none"> So, the G6PD test is most frequently used in the primary level facilities and the test frequency is not as much prevalent in secondary and tertiary level. I don't know about the classification of the test as well. Maybe it is a confirmatory test, but I am not sure.

CONCLUSION:

Through the qualitative analysis, we got to know that the mutation carriers of G6PD may be somewhat protected against the disease called malaria, an illness spread by a certain mosquito species. It seems to be more difficult for this parasite to infiltrate RBCs when there is less functional G6PD present. The majority of cases of G6PD deficiency occur in regions of the world where malaria is widespread. So, in Indonesia and Vietnam the areas that are mostly affected by malaria in that area, the cases of G6PD are more. In this way, the prevalence of G6PD testing is more in that area.

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