

**Safety Assessment Of Over-The-Counter Personal Care And Cosmetic
Products' Ingredients Based On Product Description And Properties**



SUPERIOR UNIVERSITY

Thesis Submitted to

The Superior University Lahore

In Partial Fulfillment of the

Requirement for the Degree of

Master of Science in Allied Health Sciences

By

(IQRA WAHEED)

Roll No. SU91-MSAHW-S23-140

Session: 2023-2025

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ABSTRACT

This study examines the safety of frequently used components in over-the-counter (OTC) cosmetic and personal care products, with an emphasis on those available in Pakistan. In addition to a thorough review of the body of existing literature and regulatory frameworks, a descriptive cross-sectional survey examined 100 products that were purchased from pharmacies, supermarkets, and online shops. Ingredients from several product categories, including shampoos, moisturizers, deodorants, and hair colors, were examined based on their descriptions, qualities, and potential health consequences. Data collection involved label reviews and safety evaluations informed by scientific research and regulatory standards.

Statistical analysis showed significant correlations between ingredient types and reported safety risks, such as allergic reactions and long-term health concerns; despite international and local regulatory measures, gaps in safety assessments, ingredient transparency, and labeling practices continue; and while some products met safety regulations, others contained potentially harmful substances, such as carcinogens, endocrine-disrupting chemicals, and heavy metals.

This study demonstrated that almost 88%-96% of products found out safe regarding toxicity and carcinogens, however, 44%-56% were deficient in essential labeling, featuring instructions and emergency contacts. Moreover, 36%-44% were not effective for all skin types. As a result of these findings, it drew attention for the need of stronger regulations, improved safety, and better consumer understanding to verify higher quality products. The study enriches to the persistent debate on consumer safety in the personal care and cosmetics industry by suggesting for stronger regulations, increased accountability, enhanced testing approaches, explicit labeling, heightened post market scrutiny, and the production of safer, safer substitutes in high-risk formulations.

Chapter 1

INTRODUCTION

Personal products are referred to as a range of goods that are used for grooming, personal hygiene, and aesthetic purposes. They contain a wide range of products like moisturizers, deodorant, shampoo, toothpaste, soap, cosmetics, hair care products, and scents. To boost general well-being, enhance attractiveness, and promote hygiene, these products are used externally on skin, hair, nails, lips, and teeth (1).

With the passage of time, it has been seen that the demand for cosmetics products has increased and is increasing constantly by noticing the demand of users. According to Thomas Reuters Research, it's recorded that in 2013 the global Muslim outlay on these products rose by 1% (US\$46 billion). The study also identified the top Muslim nations in terms of cosmetics spending: Russia (US\$3.4 billion), India (US\$3.5 billion), Turkey (US\$4.4 billion), and the United Arab Emirates (US\$4.9 billion). According to a 2015 survey, the worldwide cosmetics market is valued US\$334 billion. This spending was reported to be 6.78% worldwide in 2019 by global sector outlay (2). It is anticipated that the cosmetics business would develop at a rate of about 900 billion yuan in 2023. China now owns 50% of the market (3).

Formaldehyde, quaternium-15, heavy metals (such as lead and aluminum), methylchloroisothiazolinone, methylisothiazolinone, parabens, lanolin, colophonium, and p-phenylenediamine (PPD) are common substances found in cosmetics. Hydroquinone, mercury, kojic acid, vitamin C, and corticosteroids are other chemicals frequently included in skin-whitening products (4).

A variety of substances found in personal care products (PCPs), such as skin, eye, and hair care products, may provide complicated safety risks. For example, arylamines are frequently found in oxidative hair dyes used in hair care products, whereas solid nanoparticles like TiO₂ and ZnO and ultraviolet (UV) filters may be found in skin care products like sunscreens. Moreover, many natural plant ingredients are being used in personal care products. Reviewing the safety evaluation of these products and chemicals

while taking into account their regulatory status, possible health hazards, and consumer benefits is the goal of this thesis (5).

The demand for a young appearance and devotion to current trends have propelled the hair dye industry's explosive rise. Across all population groups, the use of hair color is common personal care product, regardless of the likelihood of an adverse. The coloring technique, product classification, chemical composition, potential health risks, and regulatory frameworks are the main topics of this review of hair dye products. The most popular kind of hair color, permanent, uses arylamines in oxidative reactions, which raises questions regarding long-term exposure. Although possible negative effects, such as the risk of cancer, have been studied, the results have been mixed. The carcinogenic data in animal studies is not clearly duplicated in human study, even when hair color chemicals show moderate to low acute toxicity, such as allergic contact dermatitis. To critically assess the safety of hair dye components and address issues related to their use in over-the-counter personal care products, more research is required (6).

Only a small percentage ($\leq 20\%$) of the more than 10,000 chemicals used in the average American woman's daily use of over 12 cosmetic items have been shown to be safe, according to the Breast Cancer Fund. These substances have the potential to cause major health problems like cancer, endocrine disruption, neurotoxicity, and reproductive disorders if they are absorbed via the skin. Significant gaps still exist despite regulation efforts; for example, the US has only banned 11 substances whereas the EU has banned 1328. Some goods, including skin-whitening creams, have high concentrations of hydroquinone (9%), which is 30 times higher than the acceptable limit of 0.3%. This increases the risk of cancer, genetic problems, allergic responses, and eye damage. In the context of increasing global demand of these products and safety concerns, the harmful chemicals that have serious hazardous effects are highlighted by analyzing these products (7).

In this study analysis, serious health problems are demonstrated that are measured by the usage of personal care and cosmetic products. These products actually contained harmful chemicals which is concerned with safety and health. Although these products are using at a wide range but these products carry hazardous ingredients which has become a serious threat for health. Common chemicals present in personal care products

like phthalates and parabens have been noticed to interfere with endocrine function. It is recommended to make the regulations strict and monitor the overall process by observing the ingredients carefully, especially when people are exposed to them frequently and for extended periods of time. Observing the long term safety of such compounds is crucial in order to get their instant advantages by keeping safeguard for consumer health (8).

To ensure the safety of products for consumers as if they are getting prepared from natural or synthetic sources demands a safety examination. The basic guidelines which emphasize the importance of product composition, probability of toxicological concerns and chemical interactions are applied globally. Extensive legal framework has put in place to regulate safety concerns in European union. Actually assessment is necessary to be done as natural products demand to apply directly on the skin as public is using in a wide range. Moreover the thesis adds up by emphasizing the importance of safety concerns for public as they might face negative effects by relying on product description and attributes considering them safe, although it is demonstrated that the labelling procedures were ambiguous for a lot of products (9).

Product functionality can be improved by Nano system as it is actively participating in the distribution of active substances. Due to this feature nano hold significance importance. On the other hand, its application prevailed serious safety issues, especially the assessment done in innovative personal hygiene. Under these issues regulatory framework found it difficult to maintain the growth of nanotechnology. On a nanoscale compounds, consumers may not be able to recognize the hazards on such small measurement. These problems are especially hazardous for over-the-counter personal care products. As the market is getting bigger and with the rising demand, it is needed to examine the ingredients and safety evaluation is conducted based on constituent characteristics and their impact on human health (10).

In recent years, some techniques have been addressed for safety evaluation like read across (RAX) strategy is a technique that is crucial to next generation risk assessment (NGRA) cosmetics. The RAX method assumes the possible toxicity by determining and extracting from already existing similar substances. This approach does not demand extra testing but rely on the already available data of similar substances. As the market

is growing day by day, it makes is necessary to do the safety evaluations on actual formulas of products and ingredients, even though NGRA (next generation risk assessment) focuses on reducing animal testing and implementing advanced computational models for safety assessments. There is variation in using products according to their daily usage timelines. For the safety and protection of consumers health it is suggested to do the evaluation based on their chemical composition, taxological effects and practical usage (11).

Pakistan standard and quality control Authority (PSQCA) has in charge for the regulation of cosmetic products in Pakistan. The quality control from production, importation, distribution and sales of these goods is guaranteed be PSQCA. It coordinates with some of the departments which include; Ministry of Science and Technology, the Drug Regulatory Authority of Pakistan, and the Pakistan National Accreditation Council to enforce safety and quality standards. The coordination takes place to for the inspections and legal measures of products. Moreover, PSQCA also implement foreign regulator models such as Cosmetic Europe to fulfill the aim of enhancing the safety regulations for products (4).

The Drug Regulatory Authority of Pakistan (DRAP) has the responsibility to make sure that the cosmeceuticals are safe, effective and of high quality in Pakistan. In regulatory standards the safety of products have challenged due to the shortcomings in quality and execution of products. In order to keep the products on standards DRAP must implement best practices and appropriate methods for this purpose (12).

Moreover, According to the Cosmetic, Toiletry and Fragrance Association (CTFA), the legitimacy of the Cosmetic Ingredient review (CIR) program specifying it's result depending on three significant factors; Firstly, making sure that there must be an objective in reviewing safety process, secondly, Panel experts must be able and permit to do the evaluation for individual ingredient, thirdly, the review process and it's report must not be confidential, public can approach to review process by reports (13).

To access the safety of cosmetic ingredients CIR uses methodology based on US FDA'S OTC medication. A directing committee which is known as steering committee directs the orders, select the appropriate members as Expert panel, Create rules and policies and nominate the CIR directors, skin specialist and toxicologist ,consumer advocate,

and the chair of the Expert Panel are among the four public representatives on this committee, together with three business representatives from the Personal Care Products Council (PCPC). The safety evaluation of cosmetic products is done by expert panel. They are actually the decision-making body. For this purpose, designated persons having relevant experience are appointed. They are called third party observer. The Steering Committee oversees but does not participate in scientific discussions, hence maintaining the independence of the Expert Panel's safety conclusions. The Steering Committee oversees but does not participate in scientific discussions, hence maintaining the independence of the Expert Panel's safety conclusions. The CIR Procedures guide the review process, with potential changes recommended by the Steering Committee (14).

Given the widespread use of personal care and cosmetic goods, cosmetic safety is essential to public health. Although different regulatory frameworks for cosmetic safety have been established in places like Malaysia, the USA, and Europe, these frameworks vary greatly in terms of their enforcement and comprehensiveness. This variation emphasizes how important it is to do comprehensive safety evaluations of over-the-counter cosmetics and personal care products, especially with regard to ingredient safety. With the usage of personal care products with the increase of consumer awareness and safety concerns, this thesis work endeavors to ingress the components of well known cosmetics in Pakistan based on description and qualities (15).

The rationale behind the study lies in the need to validate the consumer safety and well being is the rationale on which this study is grounded. As millions of people use Personal care products it's crucial to evaluate their safety by examining the substances they contain. The study carries the purpose of finding out whether the substances pose a risk by using them or not such as toxicity, cutaneous irritation or sensitization.

AIM AND OBJECTIVES

Analysis the safety and side effects of many common ingredients which are commonly used in personal care and cosmetic products.

Chapter 2

LITERATURE REVIEW

In a study the evaluation of cosmetic and personal care products was conducted. It held some characteristics which were; regulatory frameworks, evaluation technique, safety issues and PCP. The study's approach made the relevant materials together. For regulatory frameworks PCP data had been gathered, combined and examined. It was found out that certain PCP's such as arylamines had minimum allergic reactants and no potential to cause cancer. Altogether PCP's found out safe but they need to be consistent worldwide. The study added that PCP's were safe. In a precise form, for the consistency of PCP'S it's crucial to ensure uniform PCP safety measures (6).

Negative response were generated in this observational study that are associated with over the counter personal care products. Data collected on 50 products which focused on negative responses on human like irritation, allergic reaction and other health problems. Through various clinical reports and customer feedback, the study target the aim to identify positive practices in order to get safe from adverse effects. The study then concluded that regular monitoring of product ingredients and consumer experiences is crucial to improve development and regulatory practices (16).

Through a quantitative analysis, a design has been made for the optimization of ingredients in personal care products. It combined computer stimulations, mathematical modeling and laboratory testing in a mixed approach to get a Comprehensive framework for safe products. It included case study approach to demonstrate the working done by experimental verification. This approach can handle a variety o products. This study added up that it provide an ecological and sustainable approach. For market strategies, product development and regulatory requirements, the findings had complied to fulfill the requirement of consumer approach which actually prioritized safety, sustainability and transparency (17).

The therapeutic effectiveness of popular over-the-counter cosmeceutical ingredients was evaluated in the descriptive study. Even though these items weren't put through the same stringent FDA testing as pharmaceuticals, many people nevertheless chose them because

they believed they would assist with skin issues. While some medications relied on minimal molecular or in vitro studies to support their efficacy, others provided extensive clinical data, according to the assessment. The safety and effectiveness of these medications needed to be carefully monitored and assessed. For these widely accessible goods to support claims and direct consumer use, more investigation and clinical validation were required (18).

A study evaluated the safety of the chemicals in personal care products at the screening level using data that was made Publically available. The primary focus of this study was the analysis of personal care product ingredients, usage trends, and accessible safety data. The products being investigated were WEN cleaning conditioners, and the prevalence of 30 chemicals in almost 20,000 products was investigated. The data came from product safety publications, FDA databases, and peer-reviewed literature. Furthermore, testing, like in clinical research, could have been necessary to assess possible toxicity; the methodology's goal was to provide a preliminary screening tool for product safety. This study evaluated the safety of 30 chemicals in three items and found that these substances were found in over 20,000 personal care products. Seven of the CIR's sixteen chemicals were FDA-approved as safe, and sixteen were safe at the level of use. Consequently, this study indicated that the compounds were widely used and believed to be safe; however, further research may have been required to determine complete toxicity (19).

A quantitative study was conducted to assess the levels of toxic heavy metals in various cosmetic products sold in Kano Metropolis, Nigeria, including face powders, skin lightening creams, and lipsticks. The results showed that these products contained heavy metals such as manganese, nickel, copper, cadmium, chromium, and lead, with concentrations ranging from 4.90-44.12 mg/kg, 3.68-11.03 mg/kg, 4.24-12.71 mg/kg, 0.07-1.74 mg/kg, 0-0.05 mg/kg, and 0.05-0.33 mg/kg, respectively. There was no obvious distinction between expensive and inexpensive goods. The study focused on the potential health risks associated with utilizing these products since heavy metals can accumulate in biological systems over time and have detrimental effects on health. Consequently, the cosmetics industry had to enact stricter laws and quality control measures to ensure customer safety. Regularly monitoring heavy metals and other

chemicals used in cosmetics production was also necessary to minimize health risks (20).

Descriptive study on human health safety evaluation of cosmetics in the EU: a legally enforced challenge found that cosmetics are a complex process that requires a complete understanding of rules and various methodologies for toxicity testing. In vitro, in silico, and Data extrapolation techniques became renowned because of the EU Cosmetics Regulation (EC) No 1223/2009, which assured the well being of cosmetics for human health and restricted animal testing (Pauwels et al., 2009; ECHA, 2017; OECD, 2019). Counsel on risk assessments, comprising of nanomaterials (SCCS, 2012) and the Utilization of other methodologies comprising of computer models, computational tools, and human cell-based testing was provided by the EU's Scientific Committee on Consumer Safety (SCCS) (NICEATM, 2020). To affirm adherence and the safety Evolution of cosmetics, it was crucial to grasp appropriate legislation, For instance, those released by the Chinese National Medical Products Administration (NMPA, 2020), the Japanese Ministry of Health, Labor and Welfare (MHLW, 2020), and the US FDA (FDA, 2020). To protect human health and ensure the quality of cosmetics, a Comprehensive approach to safety evaluation was essential, acknowledging exposure scenarios, physicochemical and toxicological profiles, and environmental effect (21).

The descriptive study Cosmetics and personal care products investigated the role of natural polymers in the composition of personal care items. It addressed topics such the types of cosmetics, their formulation that how they came into existence, the benefits of utilizing organic elements, and their individual application. The study discovered through a review of the literature that natural polymers, such as proteins and polysaccharides, were preferred due to their efficacy and safety, which improved the smoothness and stability of the final product. The study's conclusion, which emphasized the need for more research and innovation in this area, was that natural polymers matched customer desire for sustainable and safe cosmetics (22).

A descriptive study was conducted on natural personal care products - Analysis of ingredient lists and legal situation. This study used a descriptive methodology to analyze 100 ingredient lists in order to investigate the use of natural ingredients in personal care products, even if some of them are deemed harmful. Since many natural substances

were not controlled by the US FDA and may have contained hazardous pollutants, the study's backdrop was the growing demand for natural products and the necessity for proper regulation. The findings exposed gaps in European chemical regulations by demonstrating that all goods using natural components contained harmful or unclassified compounds, with 54 natural ingredients posing risks to the skin and eyes. The study drew the conclusion that with the aim of ensuring safety of personal care products that include natural chemicals, strict regulations and labeling requirements were essential, and that the manufacturing of natural ingredients could ramificate the habitat by causing habitat degradation and deforestation (23).

An exploratory and descriptive study was carried out on the application of cosmetics in Malaysia, observing the crucial factors that influenced users, including branding, ingredients, and skin problems. Based on the study, it seems significant to grasp consumer actions and choices, especially regarding hazardous substances found in cosmetics and the need for rigorous laws and labeling. In both developed and emerging nations, the cosmetics sector has been growing rapidly, among the fastest-growing markets is Asia. As customers in Malaysia grow more conscious of the possible dangers and risk linked with chemical-based cosmetics, there has been an expanding demand for natural and Halal-certified goods. The study's conclusions emphasized the importance of ingredients, branding, and skin issues in the cosmetic sector and suggested that in order for marketers to be successful in this market, they must grasp the wants and needs of their focus group. The outcomes of the study also highlighted the necessity of more investigation into how cosmetic use has an impact on consumer health and well being as well as the effects of the cosmetics business on the environment (24).

A descriptive study was examined, globally on the use of cosmetics. Certain compounds are prohibited or banned in places like the US and the EU due to potential health threat, like; cancer, birth defects, and developmental disorders. Cosmetic ingredients were observed by the regulatory frameworks like the EU and the U.S. Food and Drug Administration (FDA), but geographical differences in regulations needed careful observation. The identification of restricted ingredients was made manageable by latest advancements in analytical techniques, supporting regulation with FDA and EU standards. Public well being depended on the effective oversight and regulation of

cosmetic chemicals, demonstrating the essentiality of sustained research and refinement of assessment approaches to make certain adherence and minimize potential health risks(25).

A descriptive study was examined on the modernization of the Cosmetics Regulation Act of 2022 (MoCRA), which transformed cosmetic defensiveness and liability, clarifying issues encompassing negative events and industry accountability, with Americans using 6-12 cosmetic products daily. MoCRA launched critical regulations: negative event reporting within 15 business days, two-year facility registration, annual product listing and ingredient breakdown, records of safety validation, and Good Manufacturing Practice (GMP) standards. Significant progress has been made since the Federal Food, Drug, and Cosmetic Act of 1938 thanks to MoCRA, which expanded FDA authority, made safety record access possible, permitted mandatory recalls for high-risk products, and exempted small businesses from some requirements while putting consumer safety, transparency, and industry accountability first (26).

A descriptive study highlighted concerns about the safety of ingredients in widely used cosmetics. Due to possible health dangers, such as cancer, birth deformities, and developmental issues, some drugs were limited or outlawed in places like the US and the EU. The usage of cosmetic substances was governed by regulatory frameworks, including those set forth by the EU and the U.S. Food and Drug Administration (FDA). Region-specific regulations, however, necessitated close observation. Better detection of restricted compounds is now possible because to advancements in analytical techniques, which also help to assure compliance with FDA and EU standards. Public safety required effective monitoring and regulation, highlighting the necessity of continuous research and development of strategies to enforce adherence and lower health risks (27).

An explanatory study emphasized the global implementation of cosmetic and personal care products, which demonstrated considerations related to the potential health and environmental Consequences of harmful chemicals exist in these compositions. Chemicals present in Innumerable items were linked to critical health problems like cancer, allergies, hormone imbalance, infertility, fibroids, and neurological damage to cells. This Showed how promptly risk free and nature friendly needs to be included in reformulation. Manufacturers might preserve waste, expenses, and their influence on the

environment by Eliminating or substituting harmful substances and reducing chemical burden. Precisely, Rigorous safety frameworks and increased consciousness were significant for ensuring product safety, protecting human health, and sustaining the environment (28).

A research study examined the risk levels of personal care products (PCPs), Stressing on items such as hairspray, spray perfume, liquid foundation, shampoo, body wash, and solid antiperspirant. The study considered a number of variables, such as the type of product, how frequently it was used, at what quantity it was used, what was the duration of its exposure, and any possible health risks. To obtain access to exposure levels by means of both the skin and the lungs, the research methodology included a review of the body of current literature, consumer surveys, and observational studies. The results demonstrated that Although goods like body wash, shampoo, and liquid foundation examined increased cutaneous exposure, aerosol products like hairspray and spray perfume caused greater inhalation exposure. Although it emphasized the importance of regular safety observation and the regular international safety regulations, the study presented that these PCPs were safe when their usage was done according to prescription(29).

This descriptive study on Cosmetics and Their Associated Adverse Effects demonstrated that safety issues associated with cosmetic products, emphasizing on the extent of harmful outcomes, ingredient roles, and consumer recognition of these hazards . The study evaluated the frequency and types of adverse events, consisting of skin irritation and allergies, linked with specific ingredients by accomplishing a detailed literature review and conducting consumer surveys. The results portrayed a noteworthy low consumer familiarity about the hazards of cosmetics, addressing the requirement for appropriate instruction on ingredient clarity and product safety. in accordance with the study's finding producers needed to have given consumers clear labeling and information so they could make educated decisions regarding the cosmetics they bought (30).

A quantitative study examined the considerations about health convictions and the usage of over-the-counter products, investigating that how health beliefs can affect the use of over-the-counter (OTC) products. It focused on how consumers interpretate their health,

how competent they are about over-the-counter products, and how societal and cultural norms affect the usage. An assessment of the literature and questionnaires to acquire more knowledge about consumer behavior and health patterns about over-the-counter products were discussed in the process. The results demonstrated that customers having strong health concerns were more expected to take care of themselves and leverage over-the-counter products. Moreover, the use of these products was significantly influenced by awareness of their performance and safety. The study underscored the importance of consumer knowledge to explore and boost self-care practices and identify that health attitudes were an important element in the utilization of over-the-counter products (31).

A descriptive and correlational study analyzed the components that impacted consumers' aspirations to purchase over-the-counter (OTC) products as a step in their self-care rituals. Consumer customs, observed quality, public perception of the brand, price elasticity, and advertising strategies were all crucial components. To examine the major components affecting consumers' intentions to buy over-the-counter (OTC) products, the study contained statistical analysis, consumer surveys, and a review of the literature. The output of the study demonstrated that while public view of the brand or status enhance assurance and observed effectiveness, customer outlook and effectiveness influenced remarkably purchase intentions. Price consciousness also had an influence on consumers' tendency to buy, especially across different population segments. According to the study's findings, marketers must grasp these components with the intention to improve consumer collaboration and boost their contributions of over-the-counter products. It also outplayed the importance of effective advertising methodologies to amplify the awareness of customer and stimulate self-care attitudes (32).

This explanatory study, *More than Cosmetic Changes: inventorying Personal Care Product Safety*, investigated the safety of personal care products, by concentrating on possible health hazards from commonly used ingredients. Kessler precised studies on the harmful ingredients in these commodities and discussed the legal principles surrounded them. The results showed gaps in consumer knowledge regarding ingredient safety and showed that many personal care products had chemicals linked to negative

health impacts. The research precisely concluded that more consumer knowledge and advocacy were significant to ensure and support safer compositions in the personal care industry and asked for strict standards and enhanced labeling clarity (33).

This explanatory study, *Cosmetics and its Health Risks*, examined the health risks linked with cosmetic product utilization. It focused on items like hazardous chemical compositions, the outcomes of long term exposure, and lack of regulatory supervision. To gain access to the health implications of different cosmetic compounds, the research comprised a detailed examination of earlier researches and regulatory documents. The findings recommended that chemicals broadly available in cosmetics, such as phthalates and parabens, may trigger hormonal imbalances, skin irritation, and other long-term ailments. Although the greater part of cosmetics were expected to be safe, the study observed that in order to minimize any possible health issues, Rigorous laws and enhanced consumer knowledge were immortal (34).

This analytical study on the side effects of cosmetic consumption and personal care products examined the adverse health influences of using cosmetics and personal care substances. It portrayed negative effects like allergies, skin irritation, and even long term hazards from harmful substances like dyes and preservatives. After accessing earlier studies, the study precised that these compounds may trigger hormonal imbalances and, in the case of long term exposure, cancer. It came to the summary of study that strict laws and increased consumer education were required to lower the health risks connected to frequent use of these items (35).

This experimental study titled *Evaluation of Skin Irritation Potentials of Different Cosmetic Products in the Turkish Market by Reconstructed Human Epidermis Model* examined the skin irritation potential of different cosmetic products sold in Turkey. It utilized a recreated human epidermis model to imitate skin reactions and observed things like product composition and chemical makeup. The findings underscored important variations in the products' capacity to irritate skin, recommending that various compositions included irritants that can give unfavorable skin reactions. For the safety of customers from potential skin irritations, the study discovered that sophisticated testing techniques were crucial for evaluating cosmetic safety, highlighting the necessity of more stringent safety assessments and laws in the cosmetics sector (36).

This descriptive study, representation and verification of a novel cosmetics safety assessment scale (CSAS): clear comprehension of cosmetic well being and supporting international consciousness, intended to develop and verify a new scale for analyzing the safety of cosmetics. The study focused on important events like knowledge of consumer, the events of cosmetic safety, and the requirement for regularized evaluation methodologies. In order to collect information on consumer awareness of cosmetic safety, the Cosmetics Safety Assessment Scale (CSAS) was established using surveys, expert consultations, and literature reviews. The findings underscored the requirement for an effective evaluation method by showing a significant knowledge gap among consumers about cosmetic regularity. According to the study's findings, the CSAS might uplift consumer knowledge and innovative global standards for cosmetic safety, which would alternatively increase the Safety protocols of cosmetics and encourage to enhance wise consumer decisions (37).

The study, Risk Assessment of Over-the-Counter Cannabinoid-Based Cosmetics: Legal and Regulatory Issues regarding the Safety of Cannabinoid-Based Cosmetics in the UAE, was a descriptive and exploratory analysis. Its purpose is to examine the law and regulatory environment surrounding cosmetics consisting of cannabinoids in the United Arab Emirates and main points related well being concerns. The methodology contained a careful Analysis of current laws and safety methodologies, using risk assessment methodologies to get the degree of absurdity to safety practices. The results underscored the requirement for stronger safety regulations by pointing to well known regulatory gaps and discrepancies with world wide standards. The study gave the conclusion that in order to safeguard customers and assure law compliance in the UAE's cannabinoid-based cosmetics business, it was imperative to upgrade standard and set more accurate safety policies (38).

The qualitative study, Probiotics in Cosmetic and Personal Care Products: Trends and Challenges, the purpose was to to analyze the manufacturing use of probiotics in cosmetic and personal care products by analysing market practices, consumer knowledge, and the scientific reason for their inclusion. To get effective advantages and safeguard of probiotics in cosmetic products, the study analyzed the body of earlier research as well as market data. The results demonstrated that probiotic-based cosmetics

were getting well known due to their potential to boost skin health; although, problems like composition stability, legislative imitations, and the lack of absence of uniform testing methods were observed. Based on study's findings, probiotics had possibility of applications in the cosmetics sector, but their effective execution needed advanced research and transparent regulations (39).

The descriptive review study, *The Skin Sensitisation of Cosmetic Ingredients: Review of Actual Regulatory Status*, focused to execute the regulatory framework and safety assessment methodologies associated with skin sensitization caused by cosmetic ingredients. The study concentrated on important topics such testing procedures, existing legislation, and the detection of common sensitizing chemicals in cosmetic formulations. A thorough assessment of the literature and an analysis of international regulations were part of the research, which brought in existence geographical differences in safety policies. The findings suggested that there were still differences and gaps in safety testing even some nations have put policies in place to get access the sensitization potential of cosmetic compounds. In a Precise form the study concluded that in order to regular manage the risks of skin sensitization and assure consumer safety in the cosmetic sector, an integrated worldwide regulatory methodology and innovative safety assessment techniques were significant (40).

The descriptive review study, *Safety Assessment of Charcoal components as Used in Cosmetics*, targeted to examine the safety of charcoal as an item in cosmetic products. It examined possible health risks and observed at the different applications of charcoal in these products. In order to execute how charcoal collaborated with skin and the possible presence of harmful pollutants, the research methodology contained a detailed evaluation of the body of current literature and safety data. The findings underscored that even though charcoal was generally considered as safe for usage, problems such as heavy metal contamination and irregular product quality were examined. The study precisely concluded that in order to assure the safe and better use of charcoal in cosmetic Items, Stricker quality control methodologies and clear regulatory processes were needed (41).

The descriptive review study, *Non-Animal Approaches to Safety Assessment of Cosmetic Products*, targeted to examine alternative methods for assessing the safety of

cosmetics without the use of animal testing. The study observed the efficacy of Innovative and modern non-animal testing methods, involving human-based testing, computational modelling, and in vitro assays, assuring safety of the product. To execute the verification and approval of these non-animal methods, a detailed analysis of case studies, regulatory frameworks, and scientific literature was components of the process. The results evaluated significant developments in non-animal testing methods, lot of which seem as precised and economical. Nevertheless, there were still problems with these methodology standardization and Compliance acceptance. Although non-animal testing methodology demonstrated numerous assurances, the study observed that in order to completely replace animal testing in the cosmetics trade, more betterment and standardized regulatory alignment were needed (42).

The descriptive study, *The Dark Side of Beauty: An In-Depth assessment of the Health Issues and Toxicological Impact of Synthetic Cosmetics*, targeted to evaluate the health Hazards and toxicological effects linked with synthetic ingredients used in cosmetic Items. This study observed potential health risks of synthetic chemicals such parabens, phthalates, and artificial fragrances, containing skin irritation, endocrine disruption, and long-term toxicity. In order to examine the negative effects of these chemicals, the method included a detailed analysis of the body of current scientific literature, safety evaluations, and regulatory documents. The results demonstrated that even while synthetic substances were used thoroughly, a lot of them lacked detailed safety assessments, resulting in deficiencies in our knowledge of their long-term health issues. In order to reduce the possible health issued linked with synthetic cosmetic Ingredients and to assure consumer safety, the study found that rigorous safety evaluations and Compliance actions were promptly required (43).

An analytical study, *Safety and Efficacy of Cosmetic/Dermo cosmetic Products* was a descriptive study that emphasized on getting the safety and effectiveness of cosmetic and dermocosmetic compositions. It observed the components, composition stability, clinical testing, and ingredient examination that proceed into making these products safe and effective. With respect to get knowledge of the methodology and policies used toguarantee the performance and safety of products, the technique comprised a comprehensive analysis of case studies, regulatory standards, and scientific literature.

The results examined that although the majority of cosmetics were considering to be safe for consumers, there were still issues about possible adverse reactions and the requirement for detailed efficacy tests. In order to safeguard consumer health and support informed decision-making, the study observed that developing accurate principles and standardized testing processes was significant to promote the safety and effectiveness of cosmetic and dermocosmetic products (44).

The analytical study, *Toxicological Assessments of Cosmetic Ingredients: Current Status and Future Directions*, targeted to get the existing landscape of toxicological evaluations for cosmetic ingredients and to investigate future research goals. This study emphasized on evaluating the toxicity testing methods, the policy organization that monitored these analyses, and the results for consumer safety. In order to Evaluate the advantages and disadvantages of current toxicological evaluation methods, the methodology consisted a detailed study of recent literature, safety data, and regulatory standards. The results highlighted that there were still gaps in safety review procedures and a requirement for alternative testing procedures, even if our Knowledge of the toxicity of cosmetic ingredients had innovated significantly. The study concluded that enhancing consumer safety and making assurity that the safe use of cosmetic items needed improving toxicological evaluation through creative methods and organizing regulatory norms (45).

The analytical study "Regulatory Requirements for Safety/Toxicity Assessment of Cosmetics/Nanocosmetic Products: Challenges and Opportunities" aimed to examine the regulatory frameworks that governed the safety and toxicity evaluations of cosmetic and Nanocosmetic products. The assessment of current standards, procedures, and difficulties in guaranteeing regulatory agencies in the cosmetics business were the major Aims of this study. Within the framework, relevant literature, regulatory papers, and case studies were observed thoroughly to execute the state of safety executions today and major areas that required improvement. Important hurdles were observed by the research, combing the requirement for more standardized testing Processes, irregular safety evaluation methodologies, and the rapidity at which nanotechnology is developing faster than regulations. According to outcomes generated from the study, to overcome these hurdles showed probability to make more accurate policy standards and

increase safety execution methodologies, which would ultimately enhance consumer safety in the cosmetics business (46).

The article "Regulatory Requirements for Safety/Toxicity Assessment of Cosmetics/Nanocosmetic Products: Challenges and Opportunities" was a descriptive review study that examined the regulatory systems and rules included in getting the safety and toxicity of conventional and Nanocosmetic items. In order to get rid of the worries in assuring the regulatory framework in the cosmetics sector, the study majorly demonstrated current principles and methodologies. Using a descriptive review methodology, the study examined in a detail, pertinent literature, regulatory records, and real-world case studies to give a thorough collect the state of safety examinations today and major areas in requirement of establishment. The major conclusions included that the quick innovation of nanotechnology showed serious challenges for regulators because existing safety evaluation methodologies and regulatory policies failed in front of these developments. Along with calling for more regular and harmonized testing methodologies, the report also showed geographical differences in safety evaluation standards. In case of better security consumers and promote development in the cosmetics trade, the conclusion derived from this study can be stated by investigating possible perceptions for making strong safety execution practices and creating more robust regulatory frameworks (47).

The descriptive study "The Beast of Beauty: Environmental and Health Concerns of Toxic Components in Cosmetics" critically analyzed the hazards effects of toxic chemicals generally found in cosmetic ingredients on human health and the environment. To draw attention to the risks linked with ingredients including parabens, phthalates, heavy metals, and artificial perfumes, it evaluated scientific publications, legal documents, and case studies. These ingredients have been connected to environmental contamination and main health issues like cancer and endocrine disruption. The report showed that many cosmetic products constantly contained these harmful items rather than getting consciousness The study revealed weaknesses in current policies and promoted Stricker instructions and safe substitutes for items. In order to promote the use of non-toxic cosmetic formulations and reduce health and

environmental hazards, the study's conclusion emphasized the urgent need for strengthened regulatory measures and more consumer education (48).

The study "Nanotechnology in Cosmetics: Basics, Current Trends, and Safety Concerns—A Review" showed an in-depth assessment of the major principle, recent developments, and safety measures surrounding the incorporation of nanotechnology in cosmetic items. The descriptive review evaluated the unique abilities of nanomaterials, such as more absorption of active ingredients, promising stability, and better delivery mechanisms, that made them efficient for enhancing product efficiency. The study analyzed the advantages and disadvantages linked with the use of nanomaterials in cosmetics by studying case studies, regulatory standards, and scientific literature. The results showed that however these items had many advantages, their high reactivity and small size enhanced safety challenges since they might result in unanticipated biological and environmental interactions. The study stressed the need for greater research on the long-term effects of nanomaterials and enhancing the development of more precise regulatory frameworks and standardized testing methodology. The paper gave the conclusion by urging a well-rounded method that preferred safety and gave a suggestion of innovation in order to ensure the ethical utilization of nanotechnology in the cosmetics business (49).

An analytical and descriptive study "Adverse Outcome Pathways as a Tool for the Design of Testing Strategies" determined how Adverse Outcome Pathways (AOPs) could increase toxicity testing methods. By linking molecular events to health results, it examined the function of AOPs in encompassing the biological methods that caused detrimental effects. In order to get access that how AOPs could make a contribution in the development of more predictive and mechanism-based testing methods, the methods contains a study of scientific research and regulatory policies. According to the results, AOPs showed a methodical method to discuss important cellular and tissue-level methods, which made it possible to make more sensed testing techniques and maybe reduce the need for animal testing. The study also observed that by giving more clear methods for analysing chemical safety, AOPs could streamline regulatory examinations. The paper precised the conclusion by urging a broader utilization of AOP frameworks to

enhance the accuracy, effectiveness, and moral principles of toxicity testing in sectors such as medicines and cosmetics (50).

The descriptive study "Paving the Way for Application of Next Generation Risk Assessment to Safety Decision-Making for Cosmetic Ingredients" gave a detailed review of the potential use of Next Generation Risk Assessment (NGRA) in examining the safety of cosmetic items. This study analyzed the potential combination of NGRA into safety decision-making methods, which depended on innovative computational models and non-animal testing methods. In order to get the benefits of NGRA in promoting safety examinations, the technique contained looking at the case studies, scientific literature, and regulatory frameworks. According to the results, NGRA showed a more effective, moral, and scientifically sound substitute for conventional methods, enabling more precise forecasts of possible risks related to cosmetic components. But there are disadvantages as well, like the absence of defined methodology and the need for regulatory acceptance. The article concluded by promoting the use of NGRA in the cosmetics business, demonstrating how its implementation may result in more assured safety analysis and enhanced consumer safety (51).

The article titled "Principles Underpinning the Use of New Methodologies in the Risk Assessment of Cosmetic Ingredients" offered a detailed review of the key terminologies that became the base for the combination of new methods in getting the safety of cosmetic ingredients. The shift to cutting-edge approaches, such as in vitro procedures, computer models, and non-animal testing tactics, to enhance risk evaluation techniques was addressed in this descriptive analysis. To investigate the advantages and challenges of these advanced instruments, the study comprised reviewing case studies, regulatory frameworks, and scholarly literature. The results portrayed that these innovative approaches enhanced the awareness of possible risks at the molecular level and gave more moral and effective substitutes for conventional testing methods. Although, also engage attention to certain worries, consisting of need for verification, regulatory body acceptance, and the establishment of regular testing methods. The research make a conclusion by stating that by assessing the involvement of these novel techniques into risk evaluation frameworks, describing that this combination could enhance the

safetyassessment procedure for compounds used in cosmetics while ensuring adherence to changing regulatory requirements (52).

This observational study assessed the safety and effectiveness of facial skincare products. This research consists of 40 unique facial skincare products, monitoring their results and safety by customer response and medical analysis. Data was collected on a number of subjects, including as how the products functioned to heal skin problems and harmful effects that consumers may have faced. The research highlighted these products practical efficiency and safety, demonstrating the requirement of continuous analysis and evaluation to ensure both product reliability and customer prevention (53).

The article titled "Analyzing Consumer Awareness, Knowledge, and Behavior Among the Population in Putrajaya" showed a thorough examination of grades of customer awareness, education and behavior related many products and facilities within Putrajaya community. This descriptive analysis showed how consumers grasped and understand the details and facts at their eradication, which as a result affected their selections related to products. Its purpose to examine customer mindset and attitude especially with recognition to protection, standard and sustainable evaluation, the methodology consists of analyzing survey data ,discussion sessions and relevant literature. The findings highlighted that most Putrajaya customers understood the importance of making knowledgeable decisions, there were remarkable information gaps that affected their selections. The research also highlighted the effect of demographic variables on customers action and awareness i.e. age, social demographic status and academic achievement. The study concluded by emphasizing the requirement of program for good customer education to enhance knowledge and encourage righteous purchasing practices. It enables people of Putrajaya making extra ethical and informed decisions (54).

The study named "Safety Assessment of Nanomaterials in Cosmetics: it targeted the skin and hair colour products" it provides a thorough assessment of cosmetic products which were formed by use of nanomaterials with specific focus to apply on hair and skin. This descriptive study emphasized the specific features of nanoparticles ,how they effect on safety criteria and how they react alternatively with large particles. To identify the hazards and safety risks related to nanoparticles in these cosmetic goods, the

technique involved a review of the body of current scientific research, regulatory guidelines, and case studies. The findings highlight that meanwhile nanoparticles can increase the effectiveness of skin and hair colour treatments, they also raised difficulties with toxicity, skin absorption and long-term health outcomes. This analysis highlight the need of deeply examination of safety and systematized testing technique for analyze skin absorption and possible systematic effects of nanomaterials. The paper concluded by urging caution when adding nanomaterials to cosmetics and highlighting the necessity of comprehensive safety assessments to safeguard consumers (55).

Chapter 3

METHODOLOGY

3.1. Research Design

This study used a descriptive cross-sectional survey to assess the safety of substances frequently found in the formulation of over-the-counter cosmetics and personal care products.

3.2. Clinical Settings

Pharmacies (Mehmood Pharmacy, Serveaid Pharmacy, Clinix + Pharmacy), **Supermarkets** (Hyperstar, Metro Cash and Carry, Imtiaz Supermarket), **Department Stores** (AL fatah, Haji Cream Baksh, enem shop), and **internet stores** (saloni.pk, just4girls.pk, daraz.pk) were the sources of the data I used.

3.3. Sample Size

100 cosmetic and personal care items were examined for safety information and ingredient labels.

$n = (Z^2 * p * (1 - p)) / E^2$ is the formula for calculating sample size;

values for $n=100$

90 percent confidence level $Z=1.96$ #Z-score

$P=7\% = 0.7$

For one study that assessed the safety of cosmetics and personal care items, the estimated prevalence was utilized.

$E=0.05$ is the error margin.

3.4. Sampling Technique

To choose a representative sample of goods from various brands and categories, this study employed stratified sampling. This made sure that the frequently used components in over-the-counter personal care products were briefly evaluated.

3.5. Duration of Study

Four months passed after the synopsis was approved before this investigation began.

3.6. Selection Criteria

3.6.1. Inclusion Criteria

- Items from a variety of categories, such as makeup, skin care, hair care, and eye care.
- Products from many producers and brands.
- Products with available ingredient lists and labels.
- Goods that are promoted for wide consumer usage rather than prescription or specialty goods.
- Consumers can purchase personal care goods over-the-counter.

3.6.2. Exclusion Criteria

- These are only available with a prescription or that need medical supervision.
- Products designed for specific medical use, such as sensitive skin or medical disorders.
- Products without a list or label for the ingredients.
- Products with ambiguous or deceptive labels.
- Items that aren't meant for everyday use, like professional salon supplies.
- Products containing substances that regulatory bodies have already deemed dangerous or prohibited.

3.7. Ethical Consideration

This study assessed the safety of substances in personal care products, giving consumers' health and safety top priority. It made sure that the evaluation was comprehensive, objective, and considerate of laws and scientific data. In order to encourage sustainable and ethical product formulation, this study took into account the possible effects on the environment.

3.8. Data Collection Procedure

Data In order to gather data for this study, product labels and packaging were examined, ingredients were investigated utilizing scientific resources, and each product was

evaluated. To find possible safety issues and places where product formulation and labeling could be improved, the data was arranged and examined.

3.9. Data Analysis

The analysis was conducted using SPSS version 26. The most often utilized ingredients and any possible safety issues were determined using descriptive statistics, chi-square.

Chapter 4

RESULTS

A sample of OTC 100 PCP and cosmetic products are taken. Under these products four categories are made like 25 products from hair care products, 25 from eye care products, 25 from skin care products and 25 from cosmetic products and evaluated the safety of ingredients of all products by toxicity, carcinogenic effect, classified according to globally harmonized system, label for specific skin type, first aid instructions or emergency contact information, any area for improvement and any warning or cautions.

Table 4.1 P Values Of All Variables Across Four Categories

	Toxicity		Carcinogenic		Classified according to GHS		Label for specific skin types			First aid instructions on label			Any Area for Improvement			any Warning or cautions	
	No	Yes	No	Yes	No	Yes	Agree	Neutral	Disagree	Agree	Neutral	Disagree	Yes	Neutral	No	Yes	No
HCP(Dimethicone, hydrolyzed keratin, pantathenol, salicylic acid in low concentration and ceramide)	12%	88%	75%	25%	4%	96%	44%	52%	4%	8%	36%	56%	92%		8%	40%	60%
ECP(Dimethicone, retinol, caffeine, collagen and niacinamide)	56%	44%	84%	16%	56%	44%	100%	0%	0%	12%	8%	80%	76%		24%	80%	20%
SCP(Niacinamide, retinol low in concentration, collagen, aloe vera and ceramide)	56%	44%	88%	12%	56%	44%	44%	52%	4%	100%			84%		16%	80%	20%
MP(Cyclopentasiloxane, dimethicone, retinol, niacinamide and pantathenol)	56%	44%	52%	48%	52%	48%	36%	36%	28%	0%	36%	64%	72%		28%	68%	32%
P Values	0.02		0.017		0.01		0.01			0.001			0.01			0.007	

This table showed in hair care products 88% ingredients of products been tested for toxicity and safety, 75% have not carcinogenic effect, 94% classified according to globally harmonized system, 44% products labeled for specific skin types, 8% showed first aid instructions and emergency contact information on label, 92% showed need of improvement in products labelling for specific skin types and first aid instructions and 40% products showed warning or cautions sign on label.

In eye care products 44% ingredients of products been tested for toxicity and safety, 84% have not carcinogenic effect, 44% classified according to globally harmonized system, 100% products labeled for specific skin types, 12% showed first aid instructions on label, 76% showed need of improvement in products labelling that showed

ingredients have been tested for toxicity and safety and first aid instructions or emergency contact information and 80% products showed warning or cautions sign on label.

In skin care products 44% ingredients of products been tested for toxicity and safety, 88% have not carcinogenic effect, 44% classified according to globally harmonized system, 44% products labeled for specific skin type, 100% showed first aid instructions and emergency contact information on label, 84% showed need of improvement in products labelling for specific skin types and ingredients tested for toxicity and safety and 80% products showed warning or cautions sign on label.

In cosmetic products 44% ingredients of products been tested for toxicity and safety, 52% have not carcinogenic effect, 48% classified according to globally harmonized system, 36% products labeled for specific skin type, 0% showed first aid instructions and emergency contact information on label and 72% showed need of improvement in products labelling for first aid instructions or emergency contact information, specific skin types and ingredients tested for toxicity and safety and 68% products showed warning or cautions sign on label.

P values of each category with every variable is less than 0.05.

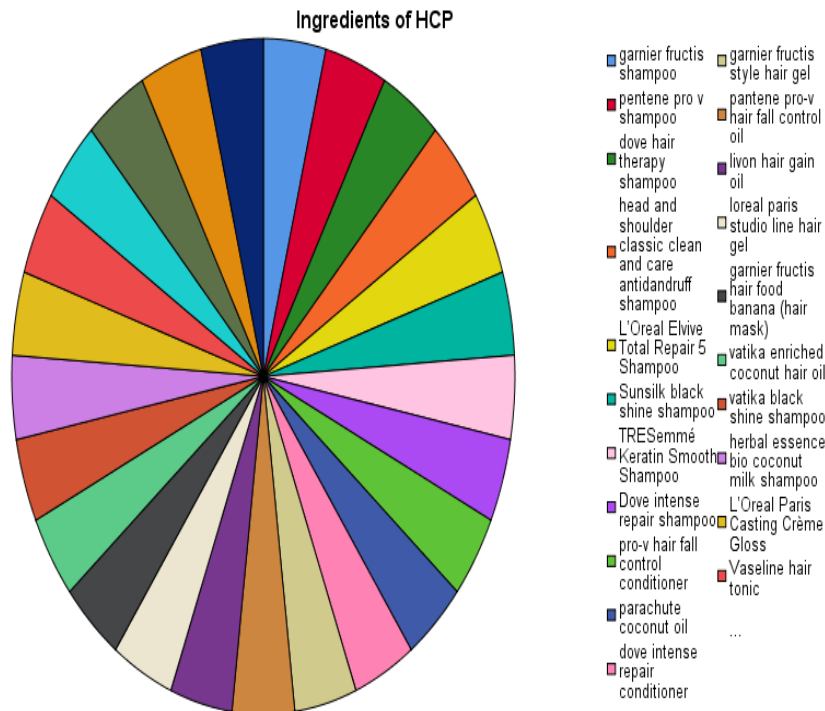


Fig 4.1.1 Pie Chart Of Hair Care Products

I took 25 hair care products which are Garnier Fructis shampoo, Pentene pro- v shampoo, dove hair therapy shampoo, Head and shoulder classic clean anti-dandruff shampoo, L'Oreal Elvive Total Repair 5 Shampoo, Sunsilk black shine shampoo, TRESemmé Keratin Smooth Shampoo, Dove intense repair shampoo, pro-v hair fall control conditioner, parachute coconut oil, dove intense repair conditioner, garnier fructis style hair gel, Pantene pro-v hair fall control oil, livon hair gain oil, loreal Paris studio line hair gel, garnier fructis hair food banana (hair mask), vatika enriched coconut hair oil, vatika black shine shampoo, herbal essence bio coconut milk shampoo, L'Oreal Paris Casting Crème Gloss, Vaseline hair tonic, garnier fructis anti dandruff shampoo, Nizoral anti dandruff shampoo, garnier ultra blend 5 precious herbs shampoo and TRESemmé hair spray.

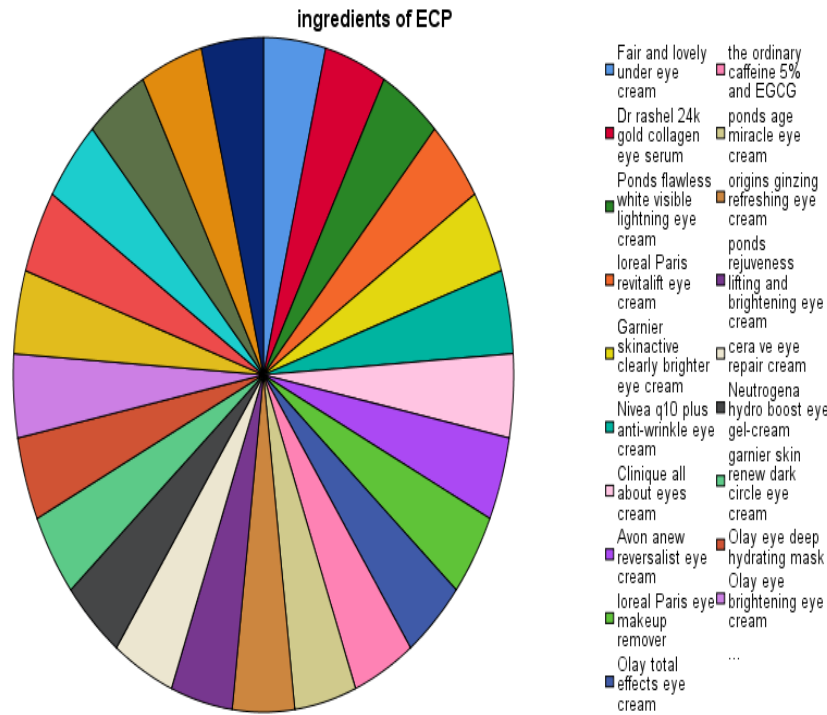


Fig 4.1.2 Pie Chart Of Eye Care Products

I took 25 eye care products which are fair and lovely under eye cream, Dr rashel 24k gold collagen eye serum, Ponds flawless white visible lightning eye cream, loreal C cream, Nivea q10 plus anti-wrinkle eye cream, Clinique all about eye cream, avon new reversalist eye cream, loreal Paris eye makeup remover, Olay total effects eye cream, the ordinary caffeine 5% and EGCG, ponds age miracle eye cream, origins ginzing refreshing eye cream, ponds rejuveness lifting and brightening eye cream, cera ve eye repair cream, Neutrogena hydro boost eye gel-cream, garnier skin renew dark circle eye cream, Olay eye deep hydrating mask, Olay eye brightening eye cream, Himalaya under eye cream, garnier skin active clearly brighter anti-puff eye roller, loreal Paris age perfect hydra nutrition eye balm, Biore brightening eye cream, boots no7 protect and perfect intense advanced eye cream and Aveeno positively radiant eye cream.

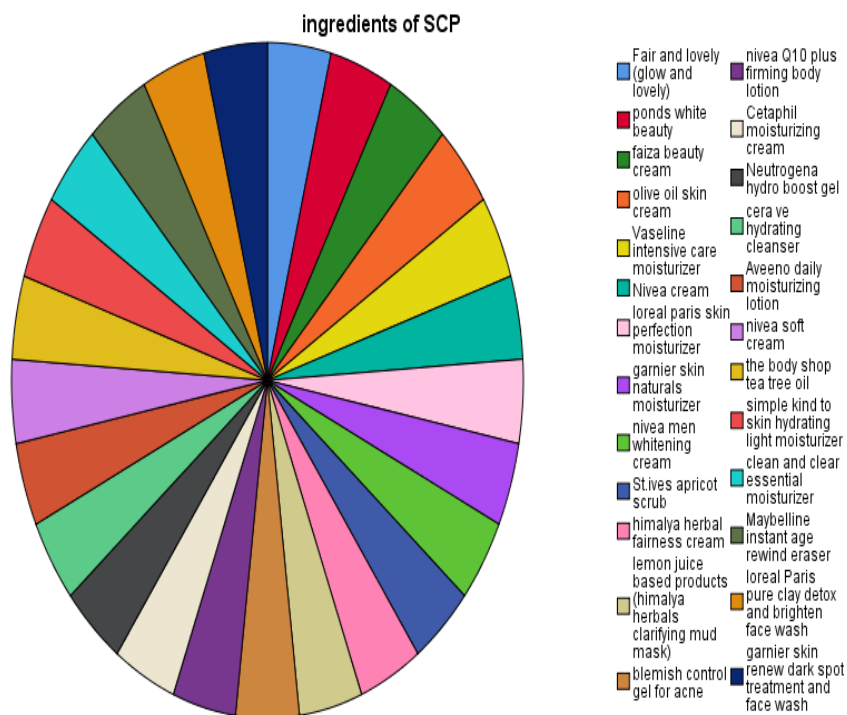


Fig 4.1.3Pie Chart Of Skin Care Products

I took 25 skin care products which are Fair and lovely (glow and lovely) cream ,ponds white beauty, Faiza beauty cream, olive oil skin cream, Vaseline intensive care moisturizer, Nivea cream, loreal Paris skin perfection moisturizer, garnier skin naturals moisturizer, nivea men whitening cream, St.ives apricot scrub,himalya herbal fairness cream, lemon juice based products(himalya herbals clarifying mud mask), blemish control gel for acne, nivea Q10 plus firming body lotion, Cetaphil moisturizing cream, Neutrogena hydro boost gel, cera ve hydrating cleanser, Aveeno daily moisturizing lotion, nivea soft cream, the body shop tea tree oil, simple kind to skin hydrating light moisturizer, clean and clear essential moisturizer, Maybelline instant age rewind eraser, loreal Paris pure clay detox and brighten face wash and garnier skin renew dark spot treatment and face wash.

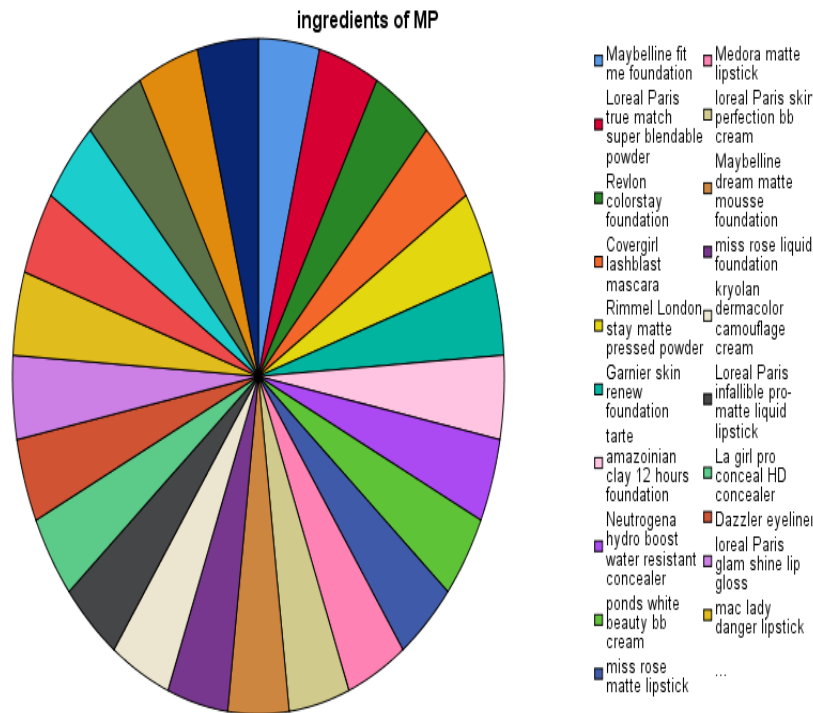


Fig 4.1.4 Pie Chart Of Cosmetic Products

I took 25 cosmetic products which are Maybelline fit me foundation, Loreal Paris true match super blendable powder, Revlon colorstay foundation, Covergirl lashblast mascara, Rimmel London stay matte pressed powder, Garnier skin renew foundation , tarte amazonian clay 12 hours foundation , Neutrogena hydro boost water resistant concealer, ponds white beauty bb cream, miss rose matte lipstick, Medora matte lipstick, loreal Paris skin perfection bb cream, Maybelline dream matte mousse foundation, miss rose liquid foundation, kryolan dermacolor camouflage cream, Loreal Paris infallible pro-matte liquid lipstick, La girl pro conceal HD concealer, Dazzler eyeliner, loreal Paris glam shine lip gloss, mac lady danger lipstick, Huda beauty faux filter foundation, stage line professional eye linear, kiss beauty contour palette, ADS concealer and kiss beauty highlighter.

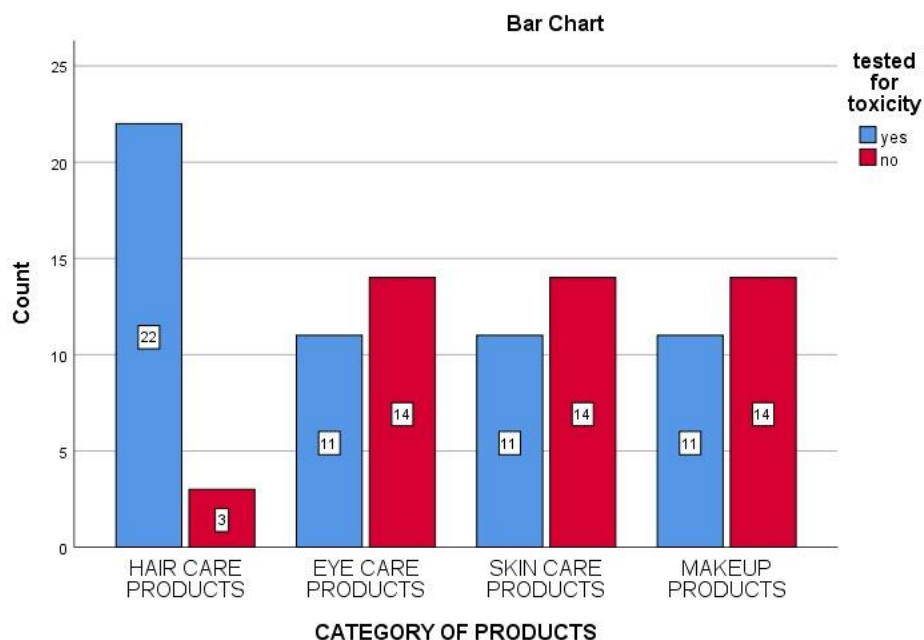


Fig 4.2.1 Bar Chart Of Tested For Toxicity

This bar chart shows how many products have been tested for toxicity and how many have not been tested for toxicity.

In Hair care products, ingredients of 22 products have been tested for toxicity (blue bar) , while 3 products have not been tested for toxicity (red bar).

In eye care products, ingredients of 11 products have been tested for toxicity (blue bar) , while 14 products have not been tested for toxicity (red bar).

In skin care products, ingredients of 11 products have been tested for toxicity (blue bar) , while 14 products have not been tested for toxicity (red bar).

In cosmetic products, ingredients of 11 products have been tested for toxicity (blue bar) , while 14 products have not been tested for toxicity (red bar).

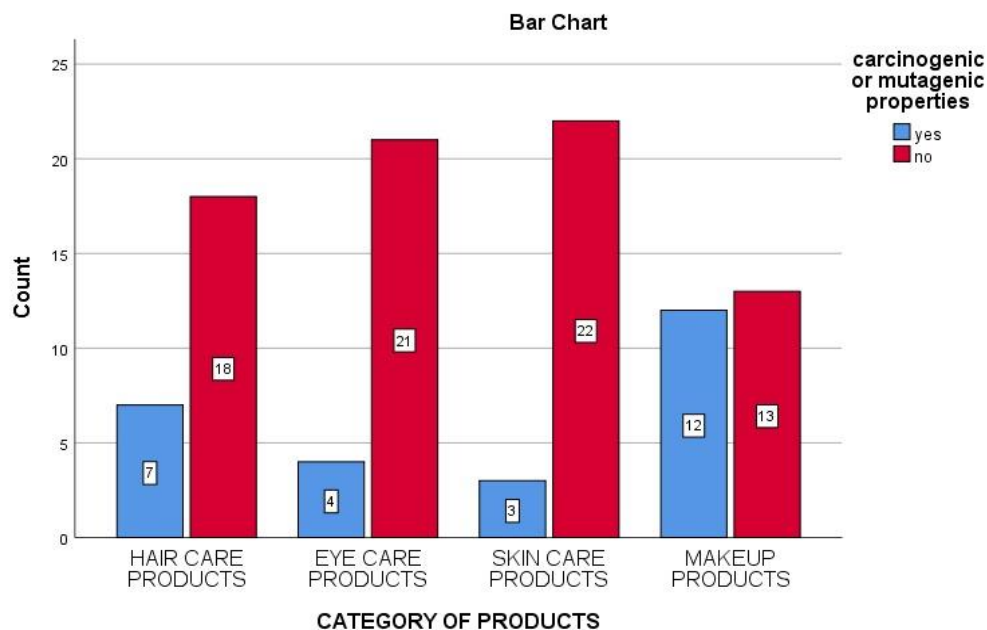


Fig 4.2.2 Bar Chart Of Carcinogenic Or Mutagenic Properties

This bar chart shows about carcinogenic or mutagenic properties.

In Hair care products, ingredients of 7 products have carcinogenic or mutagenic properties(blue bar) , while 18 products have not been carcinogenic or mutagenic properties (red bar).

In eye care products, ingredients of 4 products have carcinogenic or mutagenic properties(blue bar) , while 21 products have not been carcinogenic or mutagenic properties (red bar).

In skin care products, ingredients of 3 products have carcinogenic or mutagenic properties(blue bar) , while 22 products have not been carcinogenic or mutagenic properties (red bar).

In cosmetic products, ingredients of 12 products have carcinogenic or mutagenic properties(blue bar) , while 13 products have not been carcinogenic or mutagenic properties (red bar).

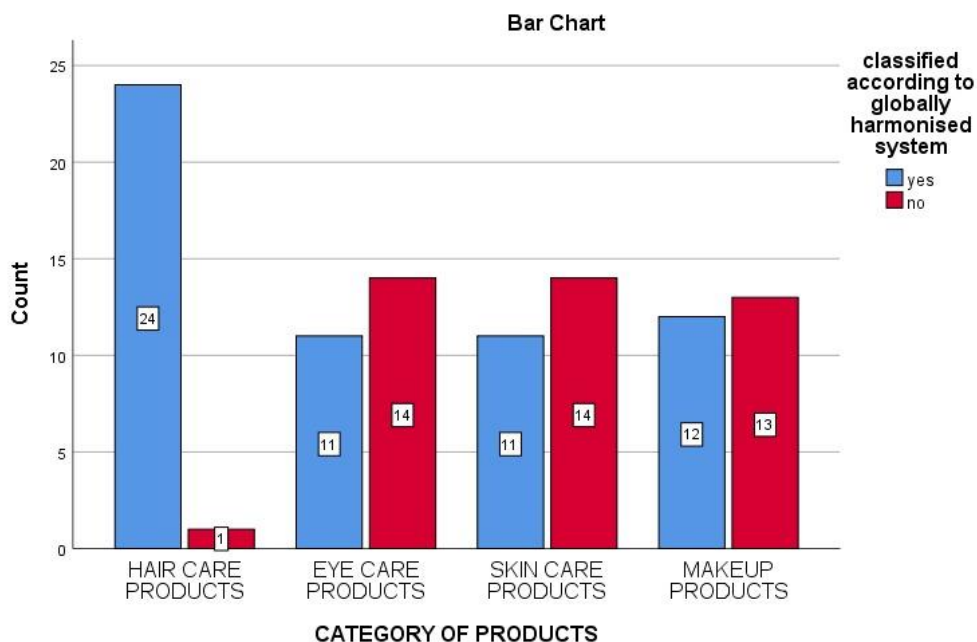


Fig 4.2.3 Bar Chart Of Classified According To GHS

This bar chart shows how many products have been classified according to GHS and how many have not been classified according to GHS.

In Hair care products, ingredients of 22 products have been classified according to GHS(blue bar) , while 1 product have not been classified according to GHS(red bar).

In eye care products, ingredients of 11 products have been classified according to GHS(blue bar) , while 14 product have not been classified according to GHS(red bar).

In skin care products, ingredients of 11 products have been classified according to GHS(blue bar) , while 14 product have not been classified according to GHS(red bar).

In cosmetic products, ingredients of 12 products have been classified according to GHS(blue bar) , while 13 product have not been classified according to GHS(red bar).

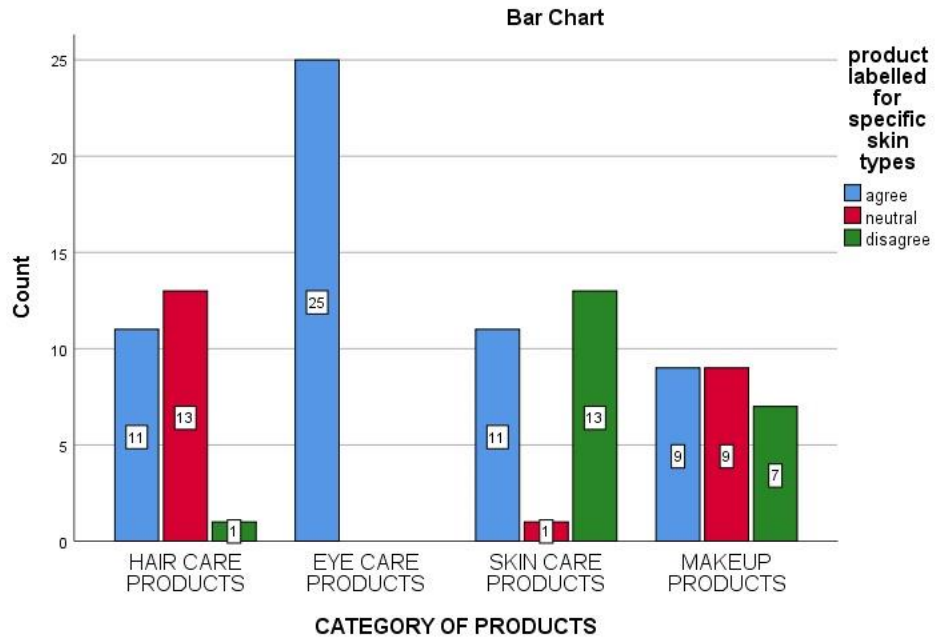


Fig 4.2.4 Bar Chart Of Product Labelled For Specific Skin Types

This bar chart indicates how many products are labelled for specific skin types and how many are not, categorized under three responses: agree, neutral and disagree.

In Hair care products, ingredients of 11 are agree (blue bar) , 13 products are neutral(red bar) and 1 product is disagree(green bar).

In eye care products, ingredients of all products are agreed (blue bar).

In skin care products, ingredients of 11 are agree (blue bar) , 1 product is neutral(red bar) and 13 products are disagree(green bar).

In cosmetic products, ingredients of 9 are agree (blue bar) , 9 products are neutral(red bar) and 7 products are disagree(green bar).

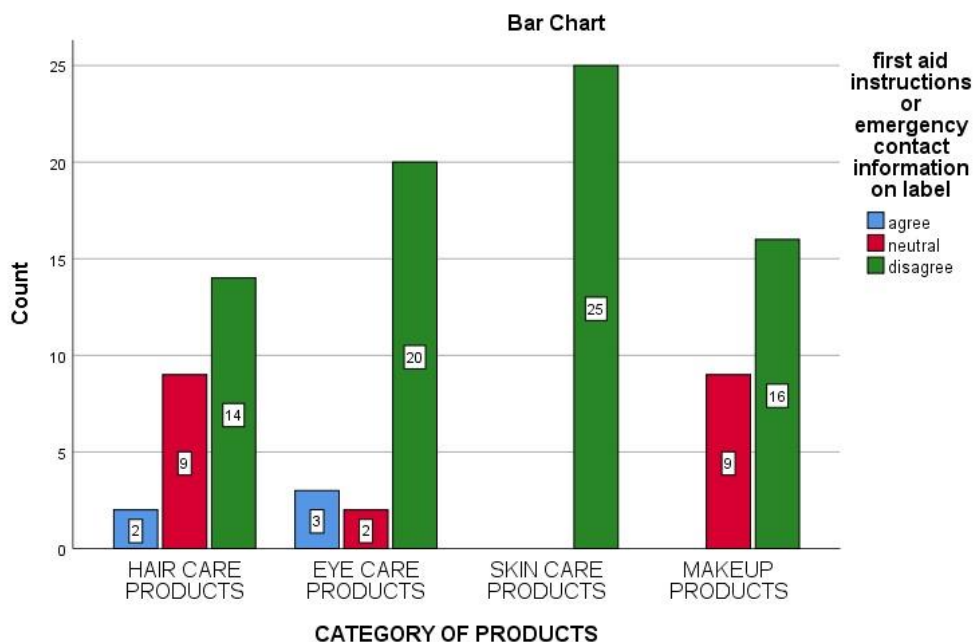


Fig 4.2.5 Bar Chart Of First Aid Instructions Or Emergency Contact Information On Label

This bar chart represents the availability of first aid instructions or emergency contact information on product label, categorized under three responses: agree, neutral and disagree.

In Hair care products, ingredients of 2 are agree (blue bar) , 9 products are neutral(red bar) and 14 products are disagree(green bar).

In eye care products, ingredients of 3 are agree (blue bar) , 2 products are neutral(red bar) and 20 products are disagree(green bar) .

In skin care products, ingredients of All are disagree(green bar) .

In cosmetic products, ingredients of 9 products are neutral(red bar) and 16 products are disagree(green bar) .

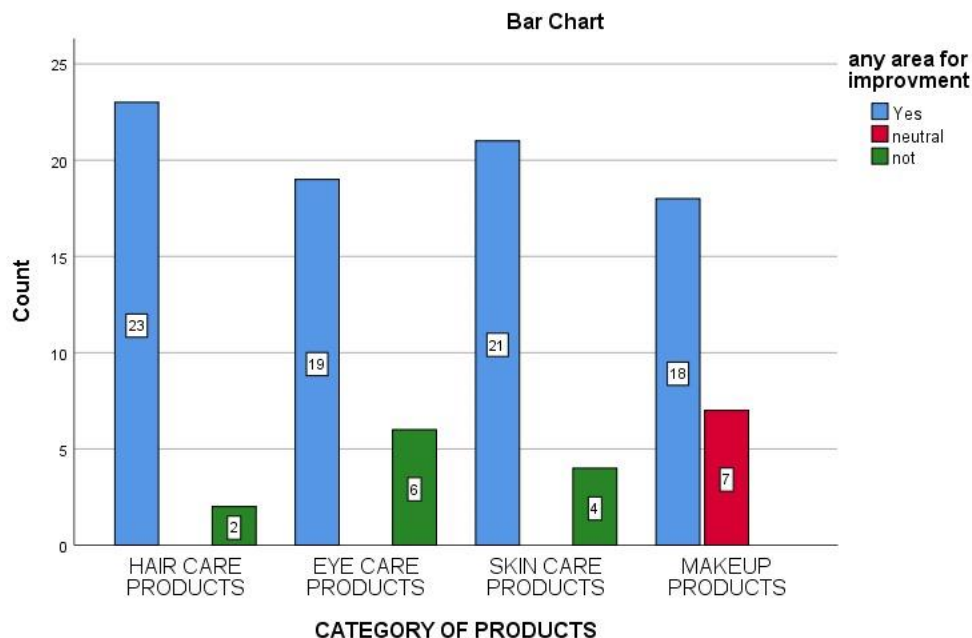


Fig 4.2.6 Bar Chart Of Any Area For Improvement

This bar shows the number of products requiring improvement, categorized under three responses: yes, neutral and not.

In Hair care products, ingredients of 23 products require improvement (blue bar) while 2 products do not need any improvement (green bar).

In eye care products, ingredients of 19 products require improvement (blue bar) while 6 products do not need any improvement (green bar).

In skin care products, ingredients of 21 products require improvement (blue bar) while 4 products do not need any improvement (green bar).

In cosmetic products, ingredients of 18 products require improvement (blue bar) while 7 products have neutral effect (red bar).

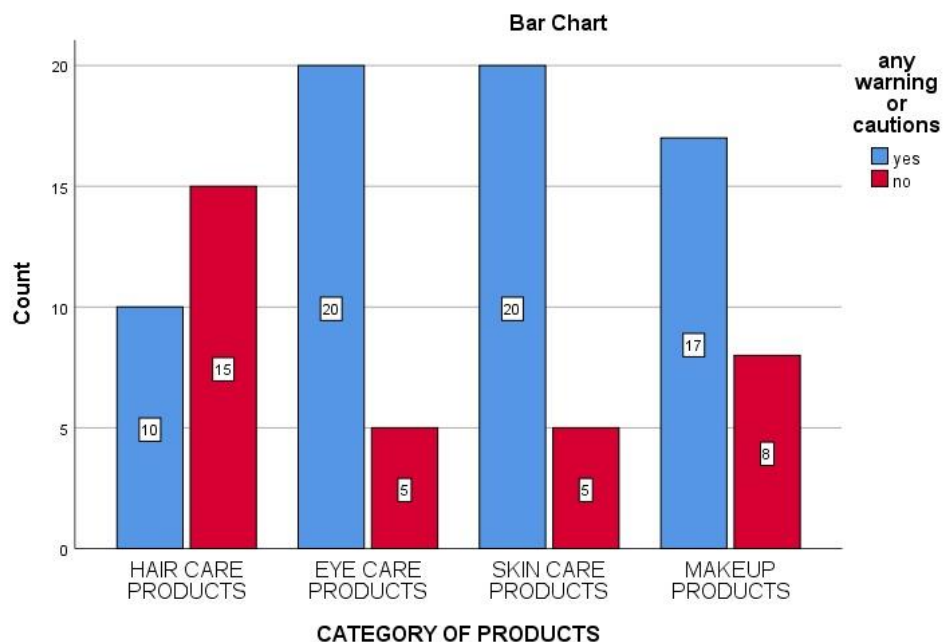


Fig 4.2.7 Bar Chart Of Any Warning Or Cautions

This bar chart shows the number of products categorized under warning or cautions on product label as well as how many are not categorized.

In Hair care products, ingredients of 10 products have warning or cautions on product label(blue bar) , while 15 products do not have any warning or cautions on product label(red bar).

In eye care products, ingredients of 20 products have warning or cautions on product label(blue bar) , while 5 products do not have any warning or cautions on product label(red bar).

In skin care products, ingredients of 20 products have warning or cautions on product label(blue bar) , while 5 products do not have any warning or cautions on product label(red bar).

In cosmetic products, ingredients of 17 products have warning or cautions on product label(blue bar) , while 8 products do not have any warning or cautions on product label(red bar).

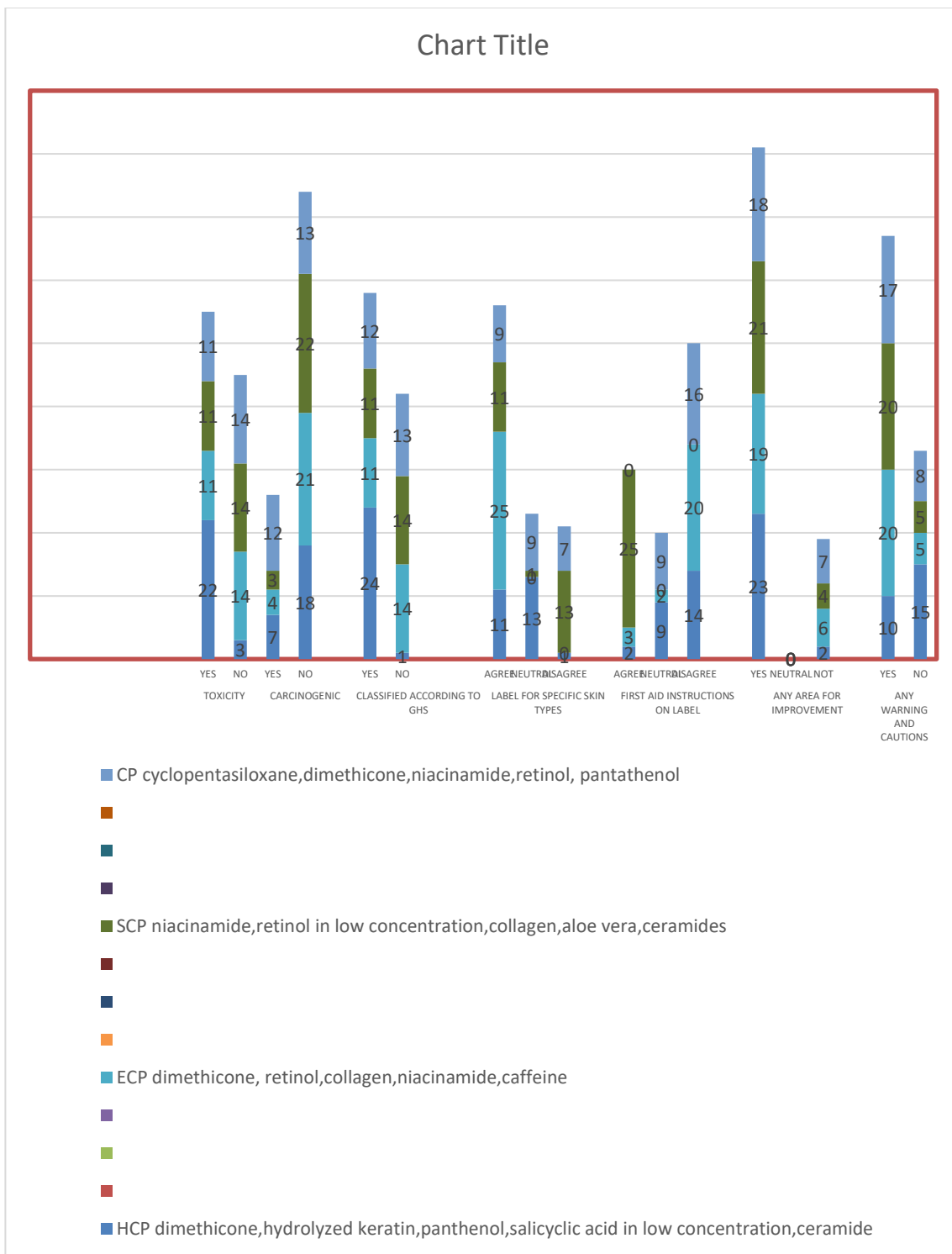


Fig 4.3.1 Categories Of Products With Their Specific Ingredients And Properties

Dimethicone, hydrolyzed keratin, panthenol, salicylic acid low in concentration and ceramide are specific ingredients found in 25 hair care products. In terms of toxicity, ingredients of 22 items (88%) were deemed safe, ingredients of 18 products (75%) were deemed safe due to the absence of carcinogens, and ingredients of 24 products (96%) satisfied GHS requirements. Ingredients of Only 11 items (44%) were found to be appropriate for different skin types, while ingredients of 14 goods (56%) lacked proper labeling, especially for emergency contact details and instructions and 10 products (40%) showed warning or cautions sign on label.

Specific ingredients included in 25 eye care products include retinol, dimethicone, caffeine, collagen, and niacinamide. Ingredients of 11 products (44%) were deemed safe for toxicity, and ingredients of 21 products (84%) were deemed safe for the absence of carcinogens. Ingredients of all of the items were suitable for different skin types, and ingredients of 11 (44%) of them met GHS classification requirements. Ingredients of only 3 products (12%), though had proper labeling and 20 products (80%) showed warning or cautions sign on label.

In 25 Skin Care products, Specific ingredients are niacinamide, retinol low in concentration, collagen, aloe vera and ceramide. Ingredients of 11 products (44%) were deemed safe for toxicity and compatible with GHS guidelines, Ingredients of 22 products (88%) are safe for not containing carcinogens and Ingredients of 11 products (44%) were suited for specific skin types. Ingredients of every product (100%) had proper labeling that included emergency contact details and clear directions and ingredients of 20 products (80%) showed warning or cautions sign on label.

Certain ingredients found in 25 cosmetic items include retinol, niacinamide, dimethicone, cyclopentasiloxane, and panthenol. Ingredients of only 9 products (36%) were suitable for different skin types, and none had adequate labeling, particularly regarding instructions and emergency contact information. The findings indicate that the majority of products in each category were deemed safe, although concerns regarding certain ingredients and labeling practices were raised. The results highlight the importance of improving product labeling, particularly for instructions and emergency contact information, to enhance safety and consumer confidence. Ingredients of eleven

products (44%) were found safe for toxicity, and ingredients of 13 products (52%) were classified according to the GHS system and deemed safe for not having carcinogens and ingredients of 17 products (68%) showed warning or cautions sign on label.

Chapter 5

DISCUSSION

The study layout the safety evaluation of the substances found in well known personal care products marketed in Pakistan. The aim of this evaluation was to bring focus to potential health issues connected to such items, as well as pointing out limitations of local regulatory system.

The major goal of this study was examining the occurrence of potentially harmful ingredients that are widely used in personal care products such as parabens, phthalates, heavy metals and allergies. In doing so, the study pursued to promote awareness of potential risks connected to widely use of these products among consumers and policymakers.

A sample size of 100 products from different product Category was chosen by using a classified selection strategy in order to pledge that the study was reflective and included a wide range of products. The different categories included makeup, eye care, and hair care allowed for an in depth analysis.

The results showed that the ingredients like parabens, phthalates and heavy metals which showed serious toxicological hazards in scientific studies were present in a significant amount of products under evaluation. Some other hazards are endocrine disruption, carcinogenicity and other long term health impacts.

The results of investigation are consistent with earlier studies. By observing the previous study, like the research done by Bilal and Iqbal et al. (2019) also determines the risks that are linked with the ingredients like parabens, phthalates as they are frequently used in over-the-counter products. The investigation done under these ingredients presented that it can cause disruption in endocrine processes which can result in hormonal imbalance and various health problems.

Another research, by Pogisego Dinake et al's studies (2023) determined the presence of harmful compounds like phthalates and heavy metals in cosmetics. This research highlighted the regulatory gaps which allowed harmful ingredients to be used in consumer products.

The analysis of the study determined a considerable relations between particular product Category and ingredient safety levels. As an example; skin dyes cream and color dye are classified as high risk categories as they contain harmful ingredients like arylamines and hydroquinone.

Past research, like those by McGregor et al. (2007), have elevated fears about hydroquinone in particular. Those analysis initiated concerns over the safety of cosmetic products, highlighting that some ingredients, such as hydroquinone, have been banned or limited in some places because of their links to serious diseases like cancer, birth defects and developmental disorders. The analysis also illustrated how different areas have varying regulations. While many nations govern cosmetics and personal care products through regulatory frameworks like those set up by the European Union (EU) and the U.S. Food and Drug Administration (FDA), geographical variation in regulations call for more observation and stricter supervision.

The investigation abruptly demonstrated that the belief about natural products that they are always safe was challenged due to presence of allergen and irritants in some natural products.

The conclusion of the fact that natural ingredients might have harmful effects is being conducted in a study by Young et al. (2022). This study showed that plant based cosmetic products can cause phototoxicity, irritation, and sensation and may have some other negative dermatologist effects.

The lack of transparency in product labelling made another conclusion for the study, it made lack of details in ingredient lists which revealed serious flaws in labeling procedures. Due to the flaws in labeling and having lack of details about the products made the customers restless that they became unable to choose the products they use with knowledge. Moreover, due to lack of details for products, this create a problem for regulatory companies that it also made difficult for them to evaluate safety concerns.

As a result of these distinctions which are aligned together made agitations for regulatory compliance, it especially triggered in developing nations where defensive laws for consumers are more relaxed.

The study offered thorough information about the safety of particular chemicals in several product categories. Dimethicone, hydrolyzed keratin, pantothenol, salicylic acid (in small amounts), and ceramide were considered safe ingredients for hair care products, while sodium lauryl sulphate, alcohol denat, synthetic dyes, and heavy metals were considered dangerous because they could irritate skin.

Similarly, for eye care products, hydroquinone, parabens, and retinol (in high concentrations) were categorized as harmful ingredients because of their link to irritation and hormonal imbalances, while dimethicone, retinol, caffeine, collagen, and niacinamide were deemed acceptable.

Concerns about safety were raised by the possibility for irritation and hormone disruption caused by hydroquinone, parabens and synthetic fragrances while niacinamide retinol at low concentration ,collagen, aloe vera and ceramide were found to be safe in skin care products.

Finally, parabens, alcohol denat, and synthetic dyes were known to cause allergic reactions and long-term health hazards, but cyclopentasiloxane, dimethicone, retinol, niacinamide, and pantothenol were considered safe ingredients for cosmetic products.

The report identifies serious deficiencies in Pakistan's labelling transparency and regulatory enforcement. Pakistan does not have strict regulations for cosmetic safety, in contrast to the EU, which requires thorough safety evaluations and ingredient declarations. Customers are seriously at danger when labels lack emergency contact details and first-aid advice.

To address these concerns, the study recommends:

Underlying the fact of health issues and for their immediate consequences it's necessary to implement regular safety assessments of ingredients on all over the counter personal care and cosmetic products. This would evaluate the safety concerns and make the product testing safer.

To improve labeling standards it's crucial to implement detailed labels which include various things like component list, usage, guidelines, and emergency contact details. It will enhance consumer awareness by guiding them to read the

labels and getting aware of the dangers one might affect by harmful ingredients. To reduce the health risk, this practice is encouraged to use safer formulations by promoting the usage of sustainable, non-toxic and safe chemicals.

In accordance with global standards, Pakistan's cosmetic and personal care sectors can achieve a safer standard for products as well as for the public by handling the problems wisely.

The results that have been drawn demonstrated that there is a crucial need to make the frameworks and labeling procedures rigorous. For the health safety of public, implementation of safer formulas, improving product testing and raising customer knowledge is encouraged. For further studies it is suggested to must acknowledge the frameworks to regulate safety concerns by demonstrating the impact on health of various ingredients.

Furthermore the study integrates to expand compilation on cosmetic safety standards and to recognize focal areas where products formulation needs to be improved. This will ensure the strict regulations and make aware of manufacturers, consumers and politicians to understand the health hazard ingredients used in various products.

The outcome of these findings are multifold. There are more than one perspectives under this study which includes consumer, industry and customers. In the perspective of consumer, inadequate labeling can direct adverse reactions and can deteriorate consumer assurance. For the industry, possibilities for both risk and opportunity can arise. By following best practices, comprehensive testing methods, safety regulations can ensure the safety of manufacturers and consumers, it can enhance the reputation in market. It can also elevate competitive edge in global market. Moreover, to monitor the frameworks rigorously, advance methods such as next generation risk assessment and computational toxicology can modernize product safety evaluation.

The safety evaluation of the personal care and cosmetic products has demonstrated in various research studies such as the United States and the European Union. In context of research aligning with Pakistan seems distributed or scattered.

International markets follow strict rules, processes, standards and policies to maintain the standards and labeling of products. In comparison to international markets, when research on Pakistan's Regulatory framework is demonstrated it can be seen that it outlay both challenges and opportunities. It can be seen by a fact that as EU regulates detailed toxicological examination or evaluation and regulatory compliance but unfortunately it sometimes relies on outdated safety protocols. This study proposes research gap by presenting empirical data and with the presentation of data it delivers a comparative perspective for the guidance of regulatory reforms corresponding with global best practices.

Nano system will optimize the transport and durability of active and safe ingredients but regulatory system does not have ability to proper analysis of these systems.

In conclusion, the study enlightened that in Pakistan the need of safety evaluation of ingredients of cosmetics and personal care products through safety concerns and evaluations is crucial to make the better legal framework, better product testing procedures and increase consumer understanding with the frameworks and safety concerns. By overcoming the issues and challenges personal care and cosmetic products sector can make better concerns for public safety to reach international standards.

CONCLUSIONS

The results emphasize the importance of enhancing regulatory structure, enhance awareness and develop safe formulation methods of products. Standard and safety of personal care and cosmetic products' ingredients can be upgraded by focusing on these concerns. This study conclude many personal care and cosmetic products contain harmful ingredients but at the same time some products fulfill the standards of safety, gaps in regulatory structure and mention hazards for customer health.

Limitations

- **Sample Size:**

The study examines 100 products, which could not precisely consider the vast selection of personal care and cosmetic products on the trading floor.

- **Data Source:**

An insufficient number of store places and online services offered the products, which may not have completely covered the variety of brands and development methods.

- **Verification Of Ingredient:**

The study depend on information marked on label, which may not completely covered the formulation of the product because of incorrect or insidious labelling.

- **Laboratory Testing:**

To confirm the existence or concentration of potentially harmful components, no independent laboratory analysis was carried out.

- **Geographic Scope:**

The results are unique to Pakistan and might not apply to other areas with dissimilar legislative frameworks.

Recommendations

- **Enhanced regulatory oversight:**

By promoting transparency and guaranteeing that producers adhere to strict safety evaluation standards, strengthen international regulatory frameworks for over-the-

counter personal care and cosmetic products.

- **Adoption of advanced testing methods:**

To enhance safety evaluations and lessen dependency on animal testing, promote the use of new approach methodologies (NAMs), such as computational models and in vitro testing.

- **Best consumer education and Labelling:**

Encourage the disclosure of all substances and their concentrations on cosmetic product labels so that customers can make safer decisions. Additionally, raise public awareness of the possible dangers associated with specific compounds used in cosmetics.

- **Post market surveillance:**

To keep an eye on the long-term effects of frequently used cosmetic components, particularly those with documented health hazards, more robust post-market surveillance methods should be put in place.

- **Creation of safer ingredients:**

Promote the study of substitute, non-toxic components, especially for formulations of items like sunscreens, hair dyes and skin whitening agent whose chemical makes them to more likely to be harmful to health.

