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Polymeric Materials for Bone and Cartilage Repair Using IBM SPSS Statistics Method

***Chandraprakash Shivram Padmavat**
International Centre of Excellence in Engineering and Management, Aurangabad, Maharashtra, India.
*Corresponding Author Email: drcspadmavat@gmail.com

Abstract. Polymeric materials for bone and cartilage repair Introduction: Polymers are called macromolecules made up of very large molecules natural or artificial one of the classes of objects, the simple chemicals called monomers are multiples of units. Polymers many substances in living things make, for example, proteins, cellulose, and nucleic acids. Natural and synthetic polymeric materials in bone tissue engineering are widely used because they are extracellular similarity to matrices and have considerable biocompatibility and biodegradability. Research significance: One of the most harmful and expensive issues in human health is dysfunction, injuries, or other types of damage to human tissue and organs. Different surgical procedures have been developed to solve these concerns, including total artificial substitutes, combined artificial kidneys, etc. Inert processed tissues heart valves, autogenic or allogeneic tissues, and total artificial kidney and prosthetic kidneys (transplantation). Organ transplantation will face significant challenges due to the scarcity of organ donors, the lifetime requirement for immunity, and its devastating consequences. Also, transplanted tissue does not provide all the functionality own tissue and can covers the donor site problem. Concerning the non-biological, there could be material issues. Like, disease, and shortage limited durability and biocompatibility. These factors have made stem cells, tissue engineering (te), and organogenesis promising and significant industries. Research doesn't offer anything. Just organs and tissues transplantation, however, can provide fresh viewpoints medications for illnesses Methodology: SPSS statistics is a data management, advanced analytics, multivariate analytics, business intelligence, and criminal investigation developed by IBM for a statistical software package. A long time, spa inc. Was created by, IBM purchased it in 2009. The brand name for the most recent versions is IBM SPSS statistics. Evaluation parameters: Natural Polymer, Proteins Collagen, Silk fibroin, Polysaccharides Chitosan, Alginates, Bacterial cellulose, Synthetic Polymers. Results: the Cronbach's Alpha Reliability result. The overall Cronbach's Alpha value for the model is .590 which indicates 59% reliability. From the literature review, the above 61% Cronbach's Alpha value model can be considered for analysis. Conclusion: Cronbach's alpha reliability results. The overall Cronbach's alpha value for the model was .590, indicating a reliability of 59%. From the literature review, the above Cronbach's alpha value of 61% can be considered to analyze the model.
Keywords: Natural Polymer, Synthetic Polymers, Bacterial cellulose

1. Introduction

Are from the recent ten years in the area of polymeric materials' antimicrobial activity, there have been notable reviews that took certain families, features, and/or applications into consideration. We tried it in this review collect all reported polymers with proven antibiotics activity with that in mind crowd and some of these examples may be omitted with a good sense [1]. Major polymer focus areas chemistry has no heat. Methods that aid in our understanding can be roughly categorized as material quality control and material property characterization. Preliminary inquiries about treatment, phase behavior and there is a degradation of polymers then the investigations continued using new polymeric materials or more advanced tools [2]. There is interest in nonlinear optics it has grown tremendously in recent times years, primarily because of telecom department high bandwidth optical is required switching and processing devices information service and data transfer requirements the computer age, and sophisticated amplification laser tools, it developed and necessary research new methods of sewing separate laser pulses to do specific functions or are immediately found in complex experiments [3]. Polymeric application materials allow more design freedom, and recycling accounts for about 82 percent of the weight of the average car. The current study's primary objective give a thorough evaluation. Applications of high-performance plastics in the field of vehicle safety and comfort. Such basic operations high-performance wide application plastics in vehicles dictating appearance vehicles, their operation, economy and low fuel consumption [4]. Correlation between cutting adhesion status by mechanisms between layers and controlled his frenzy. Since no attempt was made to deal with molecular factors, hierarchy control is full as a result of the polymer composite structure. The outcome is outstanding. The rigidity can be increased. 100 percent government property the two polymeric components are combined to create a multilayer composite [5]. Construction and characterization of synthetic polymeric self-healing which materials are drawn in by biological systems? Damage activates the autopilot. A therapeutic reaction. It is an exciting and expanding field of study that has the potential to greatly increase working life and safety. Polymeric parts for many different uses [6]. Increasing biodegradability biomedical applications of polymeric materials applications have significantly improved. The development of therapeutic devices, such as temporary implants and three-dimensional tissue engineering scaffolds, is favored by biodegradable polymeric materials. Further advancements have occurred. Biodegradable polymeric pharmaceutical materials have been used in applications including delivery vehicles. For continuous or regulated drug release [7] Tree-derived functions polymeric materials predominate. Focuses on skills such as absorption, trafficking, and self-healing. The key is finally difficulties caused by wood polymeric materials with a purpose offerings are manufactured using macromolecular engineering as well as prospective remedies or growth directions. From a scalable tree of polymeric materials with a purpose [8]. An energetic ion loses energy through nuclear and electronic energy processes as it moves through a polymer medium. Understanding the effects of electronic and atomic processes on materials has been the focus of extensive research in the past. Have but some people are guilty. Descriptions of characters nuclear and electronic shutdown make modifications to properties cutting size and cross-linking of polymeric materials [9]. Unique polymeric materials properties up to the angstrom level of a single bond, up to tens of nanometers for chain gyration, and larger when melting, in mixtures, solutions, and polymer nanocomposites (pncs). With relation to the time scales of dynamics of different objects character flaws are even more prevalent. Large-scale sorting procedures, etc., from femtoseconds to seconds or even hours. Phasing out of composites [10]. Plants that are readily available and relatively inexpensive oils are a resource that the plastics sector finds appealing from an industrial standpoint. Plant oils that occur naturally and fatty acids produced from them are extremely regarded as essential renewable resources made with chemicals vocation and production of useful polymers derived from biomass and polymeric materials [11]. This is expressly said. Lack of information available particularly the mechanisms and microorganisms involved in the biodegradation of polymeric materials. In this overview, polymers are categorized and handled based on their look and biodegradability. A biopolymer is a natural polymer that has undergone chemical modification. Examples are chosen to show the degradation mechanisms and microorganisms. A few types of polymeric materials and diagnostic techniques are employed [12]. Polymeric materials undergo degradation processes, which are evident at every stage. The life cycle is a crucial aspect to take into account when talking about their potential for future waste recovery and performance. Repurposed plastic. Items made of polymer are exposed heat-machine decomposition chain cutting and other chemical reactions could take place during processing at high temperatures and shear forces in an oxygen-poor environment [13]. Recent advancement in design and function of biocompatibility in polymeric materials and processing manufacturing technologies a fitted porous structure a special material for the production of biodegradable polymeric scaffolding for te has been made available by architecture. Design requirements for scaffolding include appropriate porosity, biodegradability, and pertinent details. Having personal flaws, etc. Individual size and shape [14]. Silk proteins can be processed with a variety of morphologies a great potential for various applications. In the future, we assume that proteins are generally employed in addition and in some cases placement of classical synthetic polymers. Produced by biotechnology silk proteins allow a product of a new generation of protein-based biopolymeric scheduled items with different types of properties and amazing apps [15]. Morphology of the superstructure and crystallinity they are replaced by polymeric materials. They choose practical applications based on thermal, mechanical, and electrical qualities. Understanding a practical method for predicting and modifying semi-crystal characteristics of polymers according to applications in polymer crystallization. The smaller dimensions restrict polymer crystallization in nanotechnology applications to sizes of the same magnitude for individual lamellar crystals [16]. People's longer lifespans have increased demand for more functional and aesthetically pleasing dental materials. The use of polymeric materials (pms) is widespread. Due to improved qualities and broad applicability, there are biomedical domains, and their use has increased. Polymers are crucial in many aspects of dentistry, among other things. Preventative, therapeutic, and regenerative measures [17]. Resulting in toxicity and bioactivity may contain imidazolium salts tuned by modifying their amphiphilic structure. This paper will focus on recent advances in biology applications of imidazolium salts and their polymeric materials, and optionally examine the structure closely such imidazolium salts and their respective functions [18]. Material science and synthetics organic chemistry and novel biotechnology are improving different types of unique polymeric materials for tissue use engineering is possible. Success biodegradable scaffolds regeneration and repair muscular tissues are present in us ability to shape design and implementation or change the current biodegradability polymer materials to obtain desirable mechanical, physical, degradation, and biocompatibility properties [19]. Particular of interest are polymeric materials, especially from a growing point of view of the technical significance of these materials. Let us consider here a medium with distinct domains non-contacting elements a and b, usually microscopic, but characterized by permeability the coefficients pa and pb are not appreciably different from these corresponding aggregate phases a and b. non-homogeneous polymer composites, block or graft copolymers exhibit well-developed domain structures, foams, and filled or partially even examples are crystalline polymers items of interest here [20].

2. Materials & Methods

2.1. Evaluation parameters: Natural Polymer, Proteins Collagen, Silk fibroin, Polysaccharides Chitosan, Alginates, Bacterial cellulose, Synthetic Polymers.

Natural Polymer: In essence, a polymer is created. a chemical process that turns a collection of tiny molecules or substances into a large molecule. Use of Tiny Molecules Conjugate Monomers is the name given to a polymer. are products made of natural polymers? These polymers were produced using condensation polymerization or further polymerization. In nature, polymers are abundantly distributed. Nucleic acids, proteins, and other natural polymers are also components of our body. Another natural polymer, cellulose, plays an important structural role in plants. The majority of naturally occurring polymers are made from condensation polymers and this composition of monomers, with water added for supplementation.

2.2. Proteins Collagen: abundant in collagen within the body, protein Its connective tissue fiber is used to build such a system. This kind of tissue is connective tissue, as its name implies. essential tissue cartilage, tendons, muscular tissue, skin, and bone. what collagen Your body contains a lot of protein. Its overall protein content is roughly 30%. The main component of your body's skin, muscles, bones, tendons, ligaments, and other attachment tissues is collagen. Additionally, your organs, blood vessels, and gut lining exhibit it. Amino acids are used to make proteins. The three main amino acids—proline, glycine, and hydroxyproline—go into making collagen. Together, these amino acids make protein fibrils. in the form of a triple helix. the body the proper To construct a triple helix, an adequate amount of Vitamin C, zinc, copper, and manganese is also needed.

2.3. Silk fibroin: Many insects, including the larvae of the moth species Antherea, Cricula, Samia, and Gonometa, as well as other insects, make fibroin, an insoluble protein that is similar to silk. When silk is unprocessed contains two main, glue-like proteins called sericin and fibroin. Princes are single fibroin filaments covered in two layers of sericin. It is believed that silk fibroin is a -keratin. Proteins that makeup skin, nails, and connective tissues are linked to hair. Light, heavy, and glycoprotein P25 are the three chains of the fibroin that the silkworm generates. Disulfide bonds join the heavy and light chains together, and P25 covalently associates the disulfide-linked heavy and light chains. P25 is crucial in maintaining the integrity of the building.

2.4. Polysaccharides Chitosan: Polysaccharide Networks, Dry Membranes, and Hydrogel Formation based on crosslinking and chitosan Tripolyphosphate (TPP), the linker, was created utilizing a novel method. TPP successfully integrated chitosan through gradual diffusion. regulated gelation Change from a random state by altering the concentrations of chitosan, TPP, and sodium chloride Similar results were obtained. You may choose the best activates for the hydrogel composite by using rheology and experiments with concentrated compression. In terms of mechanical characteristics.

2.5. Alginates: A naturally occurring, an edible polysaccharide found in brown algae is alginic acid, often known as algin. It is hydrophilic and when hydrated, forms a viscous glue. containing alginates, and salts of minerals like calcium and sodium. Its color ranges from white to yellow to brown. Alginate is frequently utilized as a type of hydrogel used in biomedicine for applications such as tissue engineering and medication administration. water-based gels cross-linked three-dimensional networks made of highly water-soluble hydrophilic polymers.

2.6. Bacterial cellulose: An organic substance is a bacterial cellulose. a chemical having the formula ($C_6H_{10}O_5$) that is created by specific microorganisms. A fundamental structure is a cellulose. Agrobacterium, Acetobacter, Sarcina spp. Ventriculi and the majority of plants are also important. Bacteria, often known as microorganisms, are classed according to characteristics that distinguish them from plant cellulose. High ductility, ductility, strength, and water-holding capability. The majority of bacteria in natural settings produce cellulose and other extracellular polysaccharides, which form protective sheaths around the cells. Numerous techniques are being researched to boost cellulose growth from cultures in laboratories, which occurs when bacteria make cellulose in nature. is a substantial procedure.

2.7. Synthetic Polymers: From it, synthetic polymers are produced. Petroleum is just oil, made by engineers and scientists. The synthetic polymers nylon, polyethylene, polyester, Teflon, and epoxy are examples. Nature Polymers are synthetic polymers that can be extracted from nature. Products that are adaptable and can be processed into biomedical foams with a variety of engines, thermal properties, and decomposition characteristics. Different polymeric families, such as polyesters, polyurethanes, and polymers generated from tyrosine, can be used to modify these qualities.

2.8. Methods: SPSS statistics is a data management, advanced analytics, multivariate analytics, business intelligence, and criminal investigation developed by IBM is a statistical software package. Long time, spa Inc. Was created by, IBM and purchased in 2009. The brand name for the most recent versions is IBM SPSS statistics. The "statistical package for the social sciences" (SPSS), a set of software tools for changing, analyzing, and displaying data, is commonly used. Multiple formats are available for SPSS. Numerous add-on modules may be purchased to increase the software's capability for data entry, statistics, or reporting. The main application is known as SPSS base. The most crucial of them for statistical analysis, in our opinion, are the SPSS advanced models and the add-on modules for the SPSS regression model. Additionally, independent programs that connect with SPSS are available from spas Inc. SPSS is available in versions for windows (98, 2000, me, nt, and XP), supported by windows 2000 running SPSS version 11.0.1. Although further versions of the SPSS will most likely be available by the time this book is released, we are certain that the SPSS instructions provided in each chapter will still apply to the studies outlined.

3. Result and Discussion

TABLE 1. Reliability Statistics

Reliability Statistics		
Cronbach's Alpha	**Cronbach's Alpha Based on Standardized Items**	**N of Items**
.590	.610	7

Table 1 shows the Cronbach's Alpha Reliability result. The overall Cronbach's Alpha value for the model is .590 which indicates 59% reliability. From the literature review, the above 61% Cronbach's Alpha value model can be considered for analysis.

TABLE 2. Reliability Statistic individual

	Cronbach's Alpha if Item Deleted
Natural Polymer	0.497
Proteins Collagen	0.591
Silk fibroin	0.491
Polysaccharides Chitosan	0.503
Alginates	0.474
Bacterial cellulose	0.536
Synthetic Polymers	0.706

Table 2 Shows the Reliability Statistic individual parameter Cronbach's Alpha Reliability results Natural Polymer 0.497, Proteins Collagen 0.591, Silk fibroin 0.491, Polysaccharides Chitosan 0.503, Alginates 0.474, Bacterial cellulose 0.536, Synthetic Polymers 0.706.

TABLE 3. Descriptive Statistics

	N	Range	Minimum	Maximum	Sum	Mean		Std. Deviation	Variance
Natural Polymer	30	4	1	5	95	3.17	.204	1.117	1.247
Proteins Collagen	30	4	1	5	88	2.93	.230	1.258	1.582
Silk fibroin	30	4	1	5	96	3.20	.232	1.270	1.614
Polysaccharides Chitosan	30	4	1	5	98	3.27	.197	1.081	1.168
Alginates	30	4	1	5	101	3.37	.265	1.450	2.102
Bacterial cellulose	30	4	1	5	106	3.53	.261	1.432	2.051
Synthetic Polymers	30	4	1	5	91	3.03	.256	1.402	1.964
Valid N (listwise)	30								

Table 3 shows the descriptive statistics values for analysis N, range, minimum, maximum, mean, standard deviation, Variance, Skewness, Kurtosis. Natural Polymer, Proteins Collagen, Silk fibroin, Polysaccharides Chitosan, Alginates, Bacterial cellulose, Synthetic Polymers this also using.

TABLE 4. Frequency Statistics

Statistics								
		Natural Polymer	Proteins Collagen	Silk fibroin	Polysaccharides Chitosan	Alginates	Bacterial cellulose	Synthetic Polymers
N	Valid	30	30	30	30	30	30	30
	Missing	1	1	1	1	1	1	1
Median		3.00	3.00	3.00	3.00	3.00	3.50	3.00
Mode		3	3	3	3	5	5	3
Percentiles	25	3.00	2.00	2.00	3.00	2.00	2.00	2.00
	50	3.00	3.00	3.00	3.00	3.00	3.50	3.00
	75	4.00	3.25	4.25	4.00	5.00	5.00	4.25

Table 4 Shows the Frequency Statistics in Natural Polymer, Proteins Collagen, Silk fibroin, Polysaccharides Chitosan, Alginates, Bacterial cellulose, Synthetic Polymers curve values are given. Valid 30, Missing value 1, Median value 3.00, Mode value 3.

Figure 1 shows the histogram plot for the Natural Polymer from the figure it is clearly seen that the data are slightly Left skewed due to more respondents choosing 3 for the Natural Polymer except for the 2 value all other values are under the normal curve shows the model is significantly following a normal distribution.

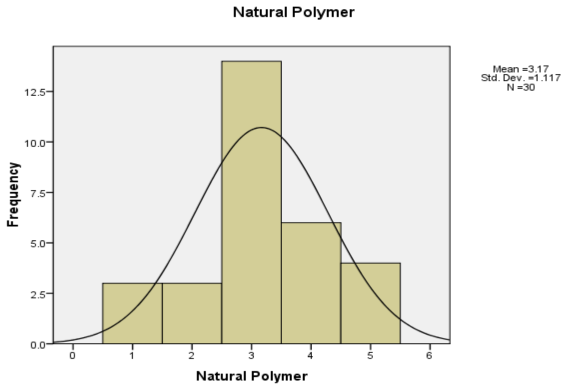

FIGURE 1. Natural Polymer

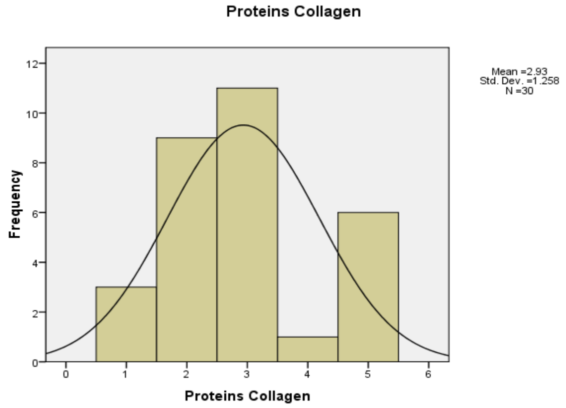

FIGURE 2. Proteins Collagen

Figure 2 shows the histogram plot for the Proteins Collagen from the figure it is clearly seen that the data are slightly Left skewed due to more respondents choosing 3 for the Proteins Collagen except for the 2 value all other values are under the normal curve shows the model is significantly following a normal distribution.

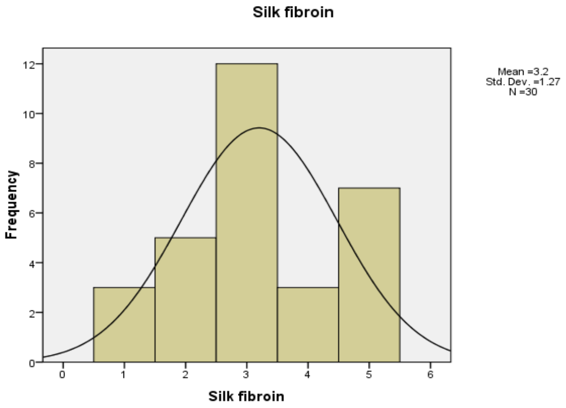

FIGURE 3. Silk fibroin

Figure 3 shows the histogram plot for the Silk fibroin from the figure it is clearly seen that the data are slightly Left skewed due to more respondents choosing 3 for the Silk fibroin except for the 3 value all other values are under the normal curve shows the model is significantly following a normal distribution.

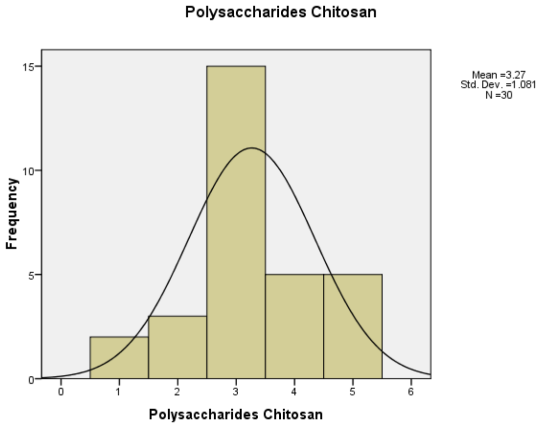

FIGURE 4. Polysaccharides Chitosan

Figure 4 shows the histogram plot for the Polysaccharides Chitosan from the figure it is clearly seen that the data are slightly Left skewed due to more respondents choosing 3 for the Polysaccharides Chitosan except for the 3 value all other values are under the normal curve shows the model is significantly following a normal distribution.

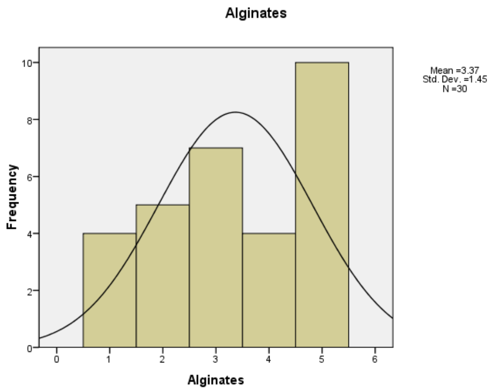

FIGURE 5. Alginates

Figure 5 shows the histogram plot for the Alginates from the figure it is clearly seen that the data are slightly Right skewed due to more respondents choosing 5 for the Alginates except for the 3 value all other values are under the normal curve shows the model is significantly following a normal distribution.

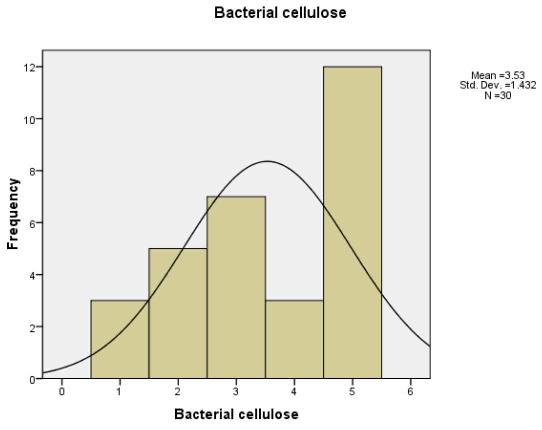

FIGURE 6. Bacterial cellulose

Figure 6 shows the histogram plot for the Bacterial cellulose from the figure it is clearly seen that the data are slightly Right skewed due to more respondents choosing 5 for the Bacterial cellulose except for the 3 value all other values are under the normal curve shows the model is significantly following a normal distribution.

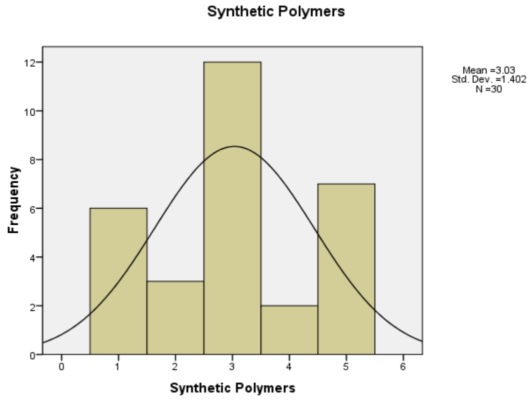

FIGURE 7. Synthetic Polymers

Figure 7 shows the histogram plot for the Synthetic Polymers from the figure it is clearly seen that the data are slightly Bell Karo due to more respondents choosing 3 for the Synthetic Polymers except for the 3 value all other values are under the normal curve shows the model is significantly following a normal distribution.

TABLE 5. Correlations

Correlations							
	Natural Polymer	**Proteins Collagen**	**Silk fibroin**	**Polysaccharides Chitosan**	**Alginates**	**Bacterial cellulose**	**Synthetic Polymers**
Natural Polymer	1	0.106	0.316	.505**	0.259	.395*	0.018
Proteins Collagen	0.106	1	0.203	0.217	0.279	0.059	-0.175
Silk fibroin	0.316	0.203	1	.588**	0.333	0.205	-0.043
Polysaccharides Chitosan	.505**	0.217	.588**	1	0.288	0.195	-0.188
Alginates	0.259	0.279	0.333	0.288	1	.451*	-0.04
Bacterial cellulose	.395*	0.059	0.205	0.195	.451*	1	-0.129
Synthetic Polymers	0.018	-0.175	-0.043	-0.188	-0.04	-0.129	1
**. Correlation is significant at the 0.01 level (2-tailed).							
*. Correlation is significant at the 0.05 level (2-tailed).							

Table 5 shows the correlation between motivation parameters for the Natural Polymer for Polysaccharides Chitosan is having the highest correlation the Synthetic Polymers is having the lowest correlation. Next, the correlation between motivation parameters for Proteins Collagen for the Alginates is having the highest correlation with Synthetic Polymers is having the lowest correlation. Next, the correlation between motivation parameters for Silk fibroin for the Polysaccharides Chitosan is having the highest correlation with Synthetic Polymers having the lowest correlation. Next, the correlation between motivation parameters for Polysaccharides Chitosan for the Silk fibroin is having the highest correlation with Synthetic Polymers having the lowest correlation. Next, the correlation between motivation parameters for Alginates for the Bacterial cellulose is having the highest correlation with Synthetic Polymers having the lowest correlation. Next, the correlation between motivation parameters for Bacterial cellulose for the Alginates is having the highest correlation with Synthetic Polymers having the lowest correlation. Next, the correlation between motivation parameters for Synthetic Polymers for the Natural Polymer is having the highest correlation with Polysaccharides Chitosan having the lowest correlation.

4. Conclusion

For millions of people, diseases that cause significant pain and disability in bone and cartilage tissues worldwide with substantial economic influence on the healthcare system skeletal repositioning for therapeutic purposes scientific community interest in elevated tissue by te preclinical animal models and clinical pilot studies have shown incredibly encouraging findings. Te stands for engineering and is used in the field with a very general approach. Utilize adult, stem, or cell differentiated cells that have previously been produced in bioreactors and are sown on top of each other on biodegradable scaffolds fit in the damaged region. A recent development in biocompatibility's structure and operation when it comes to manufacturing technology, polymeric materials, and processes a new material for the construction of biodegradable polymeric scaffolds for te has been made available by a fitted porous structure architecture. The design of the scaffold must be finished. Particular qualities, such as suitability specific needs related to personal flaws, porosity, and biodegradability, as well as custom shape and size, etc. Bone is a significant technological problem for te. To design and produce a biodegradable scaffolding that can withstand loads in vivo has a planned pore structure, and can maintain a suitable framework for an adequate amount of time. A combination of various cell lines, chemicals, whether natural or synthetic, and engrafted cartilage tissue constructs may be beneficial for the best bone design, according to several research conducted to date. For example, biodegradable polymer-inorganic biological status compounds exhibit bioactive behavior, tunable biodegradability kinetics, and mechanical qualities that are suitable for use in bone regeneration. Processing strategies for the integration of minerals and bioactive phases in porous 3d polymer networks, standard polymeric materials are modified and expanded. Hydrogels, there are, particularly when given as injections. As a result, it draws more attention. Their hydrophilicity is important for non-invasive application, conjugation, and direct cell fusion. Coordination as biodegradable scaffolds is also important. Bone benefits from bioactive compounds and cartilage regeneration are very promising and have received a lot of good press. The main problem in materials science is the control precision and reproduction of manufactured items, and there is technology in these fields. A framework for standardization of future-oriented manufacturing techniques applications used in industry. Fabrication of various scaffolding processing methods various polymeric and composite materials as well as the current development of various microstructures. But everyone has a certain flaw, etc. Beyond control pore size, distribution, and stock of the scaffold the scaffold still contains an unsafe solvent. It was suggested that scaffolds made of bone and cartilage be produced using a vast variety of different natural materials. Natural polymers are becoming more popular due to their biodegradability, low toxicity, low cost of production, low cost of disposal, and ease of regeneration, among other economic and environmental factors.

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