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Enhancement of Sensory Quality, Nutritional and Health Benefits of Complementary Baby Food through 2-6μm mid-Infrared Irradiation

By Umakanthan T, Madhu Mathi & Umadevi U

Abstract- Complementary foods are provided to infants when the amount of breast milk produced by the mother is insufficient. Numerous baby foods are available in the market worldwide but their quality is questionable. Therefore, we used our recently invented 2–6μm mid-infrared generating atomizer (MIRGA) on various brands of complementary baby foods to safely enhance their quality in terms of nutrition and sensory attributes. The effects of mid-IR irradiation on baby food included compound transformation, changes in the protein concentration, changes in the chemical bond, and changes in the nanoparticle morphology. The matrix structure and sensory attributes and other benefits were analyzed and validated with various tests and are presented here.

Keywords: MIRGA, 2–6μm mid-infrared, complementary infant food, quality enhancement, food safety, economy.

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Enhancement of Sensory Quality, Nutritional and Health Benefits of Complementary Baby Food through 2–6μm mid-Infrared Irradiation

Umakanthan T [α], Madhu Mathi [σ] & Umadevi U [ρ]

Abstract- **Complementary foods are provided to infants when the amount of breast milk produced by the mother is insufficient. Numerous baby foods are available in the market worldwide but their quality is questionable. Therefore, we used our recently invented 2–6μm mid-infrared generating atomizer (MIRGA) on various brands of complementary baby foods to safely enhance their quality in terms of nutrition and sensory attributes. The effects of mid-IR irradiation on baby food included compound transformation, changes in the protein concentration, changes in the chemical bond, and changes in the nanoparticle morphology. The matrix structure and sensory attributes and other benefits were analyzed and validated with various tests and are presented here.**

Keywords: MIRGA, 2–6μm mid-infrared, complementary infant food, quality enhancement, food safety, economy.

I. Introduction

Breast milk is the ideal food for infants as it has evolved to provide the child with the nutrients needed for growth and development. As the infant grows, the hedonic properties and composition of the breast milk change naturally. This chronological change in the characteristics of the milk fulfills the infant's growth and developmental needs and also encourages the infant to learn new eating skills and preferences *(Institute of Medicine, 1991; Picciano, 2001; Dowey, 2001; Murray, 2017).* Nevertheless, not all infants can obtain all the nutrition they need when the amount of breast milk is insufficient. Hence, the food industry has developed a wide variety of complementary baby foods including baby rice cereals and pureed meats, vegetables, and fruits. However, the quality of marketed complementary baby foods around the world is under debate *(Mohamed et al., 2018).* To complicate this problem, no scientific methods are currently available to improve the quality of complementary baby foods.

In this study, we applied mid-infrared irradiation generated by a mid-infrared generating atomizer (MIRGA) to baby foods, aiming to improve the quality of the foods. The 2–6 μm mid-IR is the safest zone in the infrared spectrum which penetrates obscurant media *(Pereira et al., 2011).* This non-ionizing-irradiated baby foods were subjected to various analyses to determine whether the changes also occurred at the molecular level. The goal was to improve the quality of complementary baby foods without compromising their safety.

II. Materials

MIRGA *(patent No.: 401387)* is a polypropylene plastic atomizer of 20 mL capacity containing an inorganic water-based solution composing Sodium carbonate monohydrate, Sodium carbonate anhydrous, Potassium nitrate and Sodium chloride. The specifications of MIRGA (MIRGA) and the process of generating 2–6µm mid-IR while spraying with MIRGA are described by *Umakanthan et al., 2022a; Umakanthan et al., 2022b; Umakanthan et al., 2023c; Umakanthan et al., 2023d* (Figure S1) *(details presented in Supplementary Text T1)*

Complementary baby foods from three different multinational brands available in the market were individually sprayed with MIRGA, taking care not to mix any brand or batch during the experiments. The samples used were from the same source in terms of the manufacturer and batch number, and the only difference among them was the number of sprayings they received.

The instruments used to identify the changes caused by MIRGA in the complementary baby foods were the following:

FTIR: Fourier-transform infrared spectroscopy (FTIR) was performed using a JASCO 4200 Plus spectrophotometer with ATR (range of 4000–400 cm^{-1} at 298 K). The aim was to detect changes in the chemical bonds.

GC-MS: Gas chromatography-mass spectrometry (GC-MS) was conducted using an Agilent Technologies 7820 GC system with a 5977E MSD, fitted with a DB-5 column. The temperature range was 100–270°C. The carrier gas was helium at a flow rate of 1.2 mL/min. GC-MS analyses revealed chemical compound transformation.

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PXRD: Powder X-ray diffraction (PXRD) was performed using a Rigaku RINT 2500 X-ray diffractometer (CuKα anode; λ = 1.541 Ao). Samples were scanned at 40kV and 30mA from 5 to 35 °C 2θ values and analyzed using PDXL2 software (Rigaku). PXRD analyses revealed structural changes.

TEM: A high-resolution transmission electron microscope (HR-TEM) model FEI –TECNAI G2-20 TWIN was used to observe the sample structure. The operating voltage was 200kV.

Proton NMR: H1 NMR spectra of milk powder samples (ca. 8mg for 1H) in DMSO-D6 (Eurisotop, France) were recorded to identify proton resonances. Spectra were acquired using a 300 MHz AVANCE II (Bruker BioSpin, Switzerland) spectrometer equipped with a 5mm BBO probe (Bruker BioSpin, Switzerland). The experiments were conducted at 298.15 K and data were processed using the standard pulse sequence library of TopSpin 3.2 (Bruker BioSpin, Switzerland). The proton resonance was identified.

3D Fluorescence spectroscopy: 3D fluorescence emission spectra were measured on a Hitachi F-7000 spectrophotometer in the range of 200–700 nm at 298 K. The spectral patterns were analyzed using the original software (Hitachi). The contour and signal-to-noise ratios were determined.

An expert sensory panel (n=6) from the dairy industry and a group of feeding mothers (n=18) participated in the study.

III. Methods

Spraying was done from a 0.25 to 0.50 m distance toward the packaged (polythene/ paper) baby food *(the spraying method is shown in the video link presented in Supplementary Video V1)*. This distance is essential for the MIRGA sprayed solution to form ion clouds, which oscillate generating 2–6μm mid-IR. The rays can penetrate the packaged material and exert their action on the baby food inside. Close spraying does not generate sufficient energy to yield the desired outcome.

A control sample of 50 g was taken from a 500 g polyethylene packet of a specific brand and batch of baby food and a sensory test was carried out. Then, the packet containing the remaining baby food was sealed with cellophane tape, and one MIRGA spraying was externally applied from a distance of 0.25 to 0.50 m. The packet was opened and a sample of 30 g was taken, which was used for another sensory test. The cycle of spraying and sensory tests was repeated 14 times. Second trial was done using another 14 samples taken from a specific second brand and batch of 500 g baby food packet. The same procedure was repeated for a specific third brand and batch of baby food also. The sensory tests were conducted using an acceptability index based on a hedonic scale with a 9-point nominal structure: 1, dislike extremely; 2, dislike very much; 3, dislike moderately; 4, dislike slightly; 5, neither like nor dislike; 6, like slightly; 7, like moderately; 8, like very much; 9, like extremely *(Everitt, 2009; Wichchuki et al., 2014)*. Analyses were repeated for increased accuracy.

The control and 4-, 10-, and 14-sprayed samples were subjected to various laboratory analyses and the obtained results were compared.

IV. Results and Discussion

After MIRGA spraying, the taste and palatability difference among the brands was substantial. Therefore, we limited our analysis and discussion to one complementary baby food made by a multinational company (Table 1).

Table 1: Sensory Attribute Test

Number of MIRGA sprayings	Score by the sensory expert panel	Opinion of feeding mothers
Control	5	Neither like nor dislike
1	5	-
2	6	-
3	6	-
4	7	Like moderately
5	7	-
6	6	-
7	7	-
8	8	-
9	8	-
10	9	Like extremely
11	6	-
12	5	-
13	4	-
14	2	Dislike very much

The control had a regular taste. The samples sprayed 4 and 10 times acquired moderately and highly enhanced sweetness, respectively, but the sweetness of the sample sprayed 14 times was greatly reduced. These changes in sensory attributes were perceived 1–5 minutes after spraying.

GC-MS of complementary baby food

Instrumentation results of Complementary baby food (raw data of all instrumentations presented in Supplementary data D1)

Table 1: Volatiles in complementary baby food, identified by GC-MS analysis

R.T. (Min)	Name of Compound	% Peak area of the samples				
		Control	4-sprayed	10-sprayed	14-sprayed	Remarks
11.15	n-Hexadecanoic acid	0.12	1.66	0.0	0.0	
11.81	n-Hexadecanoic acid	4.32	3.22	0.0	0.0	
11.93	n-Hexadecanoic acid	0.77	5.07	0.0	0.0	
12.06	n-Hexadecanoic acid	0.82	0.61	0.0	0.0	
12.48	11-Dodecen-1-ol trifluoroacetate	0.92	7.25	0.0	0.0	
12.63	n-Hexadecanoic acid	1.28	2.68	0.0	0.0	
12.71	n-Hexadecanoic acid	0.57	3.66	0.0	0.0	
12.81	n-Hexadecanoic acid	0.25	0.0	0.0	0.0	
13.02	n-Hexadecanoic acid	0.74	0.0	0.0	0.0	
13.10	n-Hexadecanoic acid	0.39	0.0	0.0	0.0	
13.28	9-Octadecenoic acid	2.20	0.0	0.0	0.0	
13.49	9-Octadecenoic acid	9.64	0.0	0.0	0.0	
13.59	trans-13-Octadecenoic acid	0.0	26.52	0.0	0.0	*Only present in the 4-sprayed sample.* Anti-inflammatory effects (Hameed*et al.*, 2016)
13.67	2,3,3-Trimethyl-1,7-octadiene	0.0	31.88	0.0	0.0	*Only present in the 4-sprayed sample.* New compound.
14.24	6-Octadecenoic acid	0.19	0.0	0.0	0.0	
14.66	Oleic Acid	0.92	0.0	0.0	0.0	
14.75	9-Octadecenoic acid	1.37	0.0	0.0	0.0	
15.35	Octadec-9-enoic acid	0.14	0.0	0.0	0.0	
15.40	9-Octadecenoic acid	0.26	0.0	0.0	0.0	
15.48	9,17-Octadecadienal	0.94	0.0	0.0	0.0	
15.58	1,1'-(1,3-Propanediyl)bis-cyclohexane	0.0	12.22	0.0	0.0	*Only present in the 4-sprayed sample.* New compound.
15.88	2-Octyl-cyclopropaneoctanal	0.35	0.0	0.0	0.0	
16.19	cis-9-Hexadecenal		0.75	0.0	0.0	
16.23	2-Hydroxy-cyclopentadecanone	2.13	0.0	0.0	0.0	
16.26	cis-9-Hexadecenal	2.71	0.0	0.0	0.0	
16.28	cis-11-Hexadecenal	0.0	1.69	0.51	0.0	
16.44	Oxacyclododecan-2-one	1.43	0.0	0.0	0.0	
16.58	15-Hydroxypentadecanoic acid	8.58	0.0	0.0	0.0	
16.83	Oleic acid	1.25	0.0	0.0	0.0	
16.96	2,3-Dihydroxypropyl elaidate	0.46	0.0	0.0	0.0	
17.12	cis-11-Hexadecenal	0.0	9.75	0.0	0.0	*Only present in the 4-sprayed sample.* New compound.
17.37	cis-Vaccenic acid	0.48	0.0	0.0	0.0	
17.43	Bicyclo[5.3.1]undecan-11-one	0.55	0.0	0.0	0.0	

17.84	Tetradecanal	8.39	0.0	0.0	0.0	
17.84	2-Cyclohexyl-dodecane	0	0.0	44.37	43.04	
17.87	(1-Methylethyl)-cyclohexane	12.09	0.0	0.0	0.0	
18.12	Oleic acid, 3-hydroxypropyl ester	13.07	0.0	0.0	0.0	
18.29	Octadecanoic acid, 2,3-dihydroxypropyl ester	2.28	0.0	0.0	0.0	
18.52	2-Methyl-Z,Z-3,13-octadecadienol	2.20	0.0	0.0	0.0	
18.75	3-Trifluoromethylbenzoic acid, 2-pentadecyl ester	1.31	0.0	0.0	0.0	
18.84	13-Octadecenal	0.5	8.39	0.0	0.0	*Only present in the 4-sprayed sample.* New compound.
19.22	9-Octadecenoic acid (Z)-, 2-hydroxy-1-(hydroxymethyl) ethyl ester	0.32	0.0	0.0	0.0	
19.71	Oleic acid	0.0	9.39	56.14	56.96	*Most abundant in the 10- and 14-sprayed samples.* Antibacterial, anticancer, immune-stimulant, and anti-inflammatory effects (Mustapha *et al.*, 2016; Helioswilton *et al.*, 2013).
19.77	9-Octadecenoic acid (Z)-, 2,3-dihydroxypropyl ester	14.12	0.0	0.0	0.0	
20.02	Fumaric acid, cis-hex-3-enyl heptadecyl ester	2.4	0.0	0.0	0.0	
20.27	9,17-Octadecadienal,	3.2	0.0	0.0	0.0	
20.70	Isopropyl linoleate	0.51	0.0	0.0	0.0	
20.91	9,17-Octadecadienal,	0.74	0.0	0.0	0.0	
21.07	Decylsulfide	1.66	0.0	0.0	0.0	
21.15	9-Octadecenoic acid (Z)-, 2-hydroxy-1-(hydroxymethyl) ethyl ester	0.35	0.0	0.0	0.0	
21.38	1,2,3,6-Tetrahydro-1-methyl-4-phenyl-pyridine	0.24	0.0	0.0	0.0	
21.76	9-Octadecenoic acid (Z)-, 2-hydroxyethyl ester	1.16	0.0	0.0	0.0	

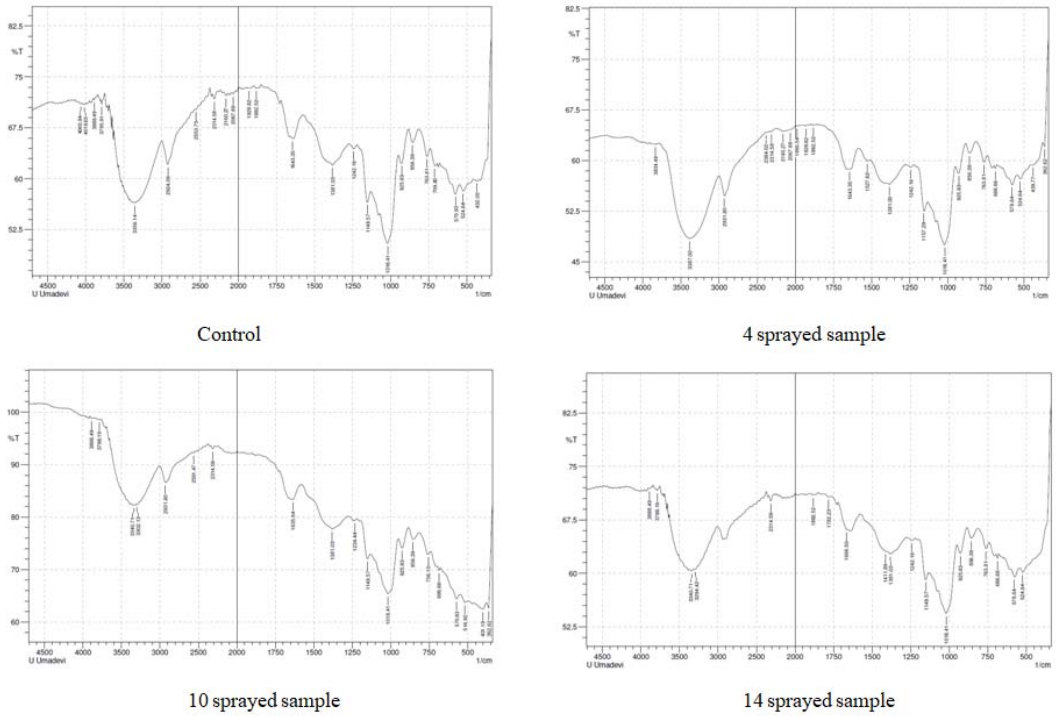

Fig. 1: GC-MS spectra of complementary baby food

The control sample contained many aldehydes and long-chain fatty acids such as oleic acid and palmitic acid. After spraying the samples 4 and 10 times, the sweetness increased and the long-chain fatty acid content, which has health benefits, increased *(Zárate et al., 2017; Hoppen brouwers et al., 2019).* In particular, the long-chain fatty acid6-octadecenoic acid (C18) and 2-cyclohexyl-dodecane were generated by spraying. The sample sprayed 14 times showed oleic acid and 2-cyclohexyl-dodecane as the major peaks. These compounds are the by-products of spraying and transformation (Figure 1, Table 1).

MIRGA spraying has been reported to increase the content of some free fatty acids, which influence the product quality, flavor, texture, and nutritional properties *(Larodan Research Grade Lipids; Human Metabolome Database)* and as a consequence, also shows health benefits *(Kilcawley et al., 2017).* The samples sprayed 10 and 14 times showed oleic acid as the most abundant compound. This fatty acid has many health benefits like increasing high density lipoprotein, reducing the risk of heart diseases, etc. *(Aleksandra et al., 2019; Anka et al., 2021)*

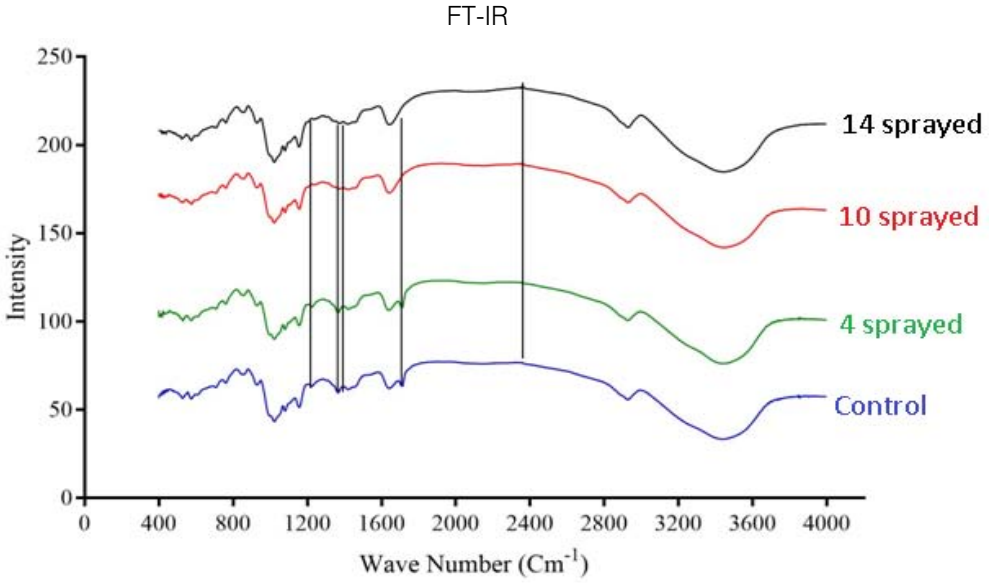

Fig 2: FTIR of complementary baby food

S-H bond stretching was observed near 2358 cm^{-1} *(Merck, 2020)* in the 10- and 14-sprayed samples, which suggests the breakage of the protein secondary structure due to the reduction of the disulfide bonds. Furthermore, the control and the 4-sprayed sample did not show any change in their protein structures. However, these two samples showed an aliphatic C=O stretching at 1700 cm^{-1} from carboxylic acid, which is most probably derived from lipids. This signal was absent in the 10- and 14-sprayed samples, which may be due to the formation of lipid anhydrides *(Merck, 2020).* C-N bond stretching was detected at 1395 cm^{-1}, which corresponded to free amino acids. The intensity of the C-N bond stretching signal waslower in the samples sprayed 10 and 14 times, indicatingthe formation of amino acid dimers *(Rumbley et al., 2001; Kazlauskas, 2018).* C-O bond stretching was observed at 1350 $cm^{-1}$for the control and the sample sprayed 4 times but it was absent in the samples sprayed 10 and 14 times. This may be explained bythe breakage of lactose into glucose and galactose (Figure 2). The increase in the sweetness of the sample sprayed10 timeswas be due to the formation of glucose from lactose *(Vernikovskaya et al., 2022).* As glucose is much sweeter than lactose, the breakage of lactose caused the increased sweetness of the baby food. However, the decreased sweetness in the sample sprayed14 times wasdue to the degradation of the baby food caused by excessive spraying.

Another C-N bond stretching was detected at 1220 cm^{-1} (Fig 2), which corresponded to the free amino acids *(Merck, 2020).* This signal was present in the control and the sample sprayed4 times but was absent in the samples sprayed10 and 14 times. This may be explained bythe formation of amino acid dimers at the amine group in the samples sprayed10 and 14 times.

PXRD

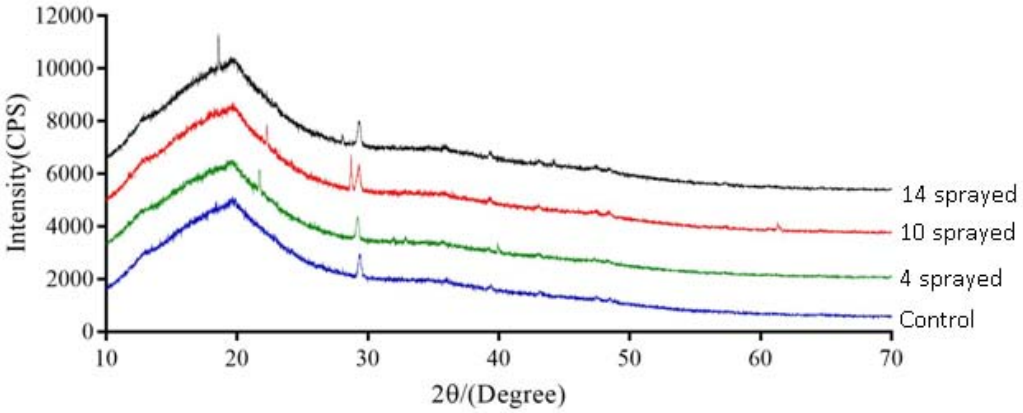

Fig. 3: PXRD of complementary baby food

All four (control, 4, 10 and 14 sprayed) samples showed a single broad peak at 19.6°. This result suggests an improvement in the crystallinity of the powders as the number of sprayings increased. However, the crystallinity of the sample sprayed 4 times decreased by 6.8% because of the formation of lipid anhydrides *(Herman, 2007).* On the other hand, the crystallinity of the samples sprayed 10 and 14 times increased by 5.9% and 9.9%, respectively (Table 2).

Table 2: PXRD analysis of complementary baby food

Percentage change in the baby food samples				
	Control	4-sprayed	10-sprayed	14-sprayed
Peak (min)	19.64	19.33	19.68	18.58
Area	111837	104215	118457	122864
Change in area	0	-7622	6620	11027
Fraction change in area	0	-0.06815	0.059193	0.098599
Percentage change	0	-6.81528	5.919329	9.859885

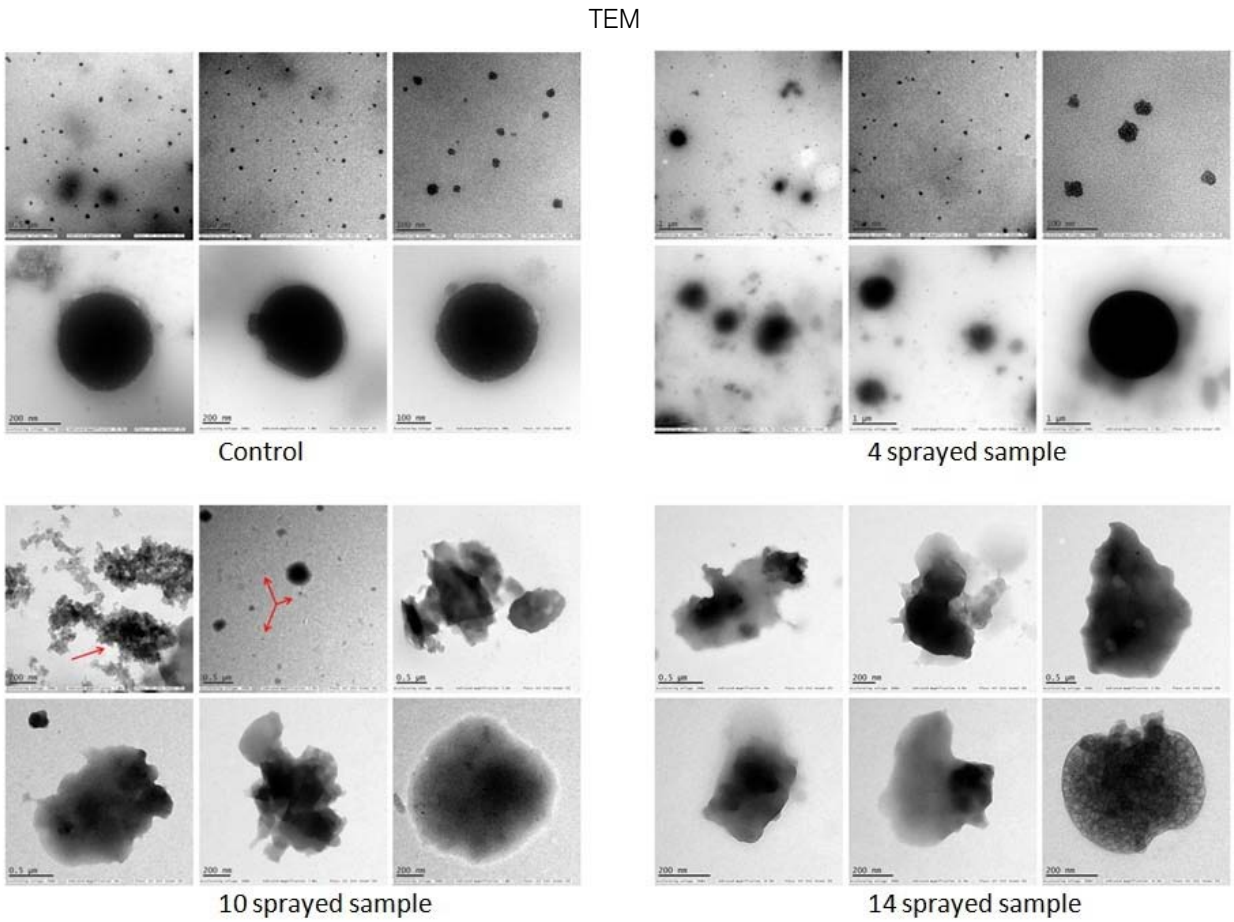

Fig. 4: TEM of complementary baby food

Table 3: TEM analysis of complementary baby food

	Control	4-sprayed	10-sprayed	14-sprayed
Size of the particles	Nanoparticles of 10–30 nm and sub-micron particles of 300–400 nm	Nanoparticles of 10–30 nm and larger sub-micrometer and micrometer-sized particles of 100–400 nm	Nanoparticles of 10–40 nm and amorphous-like aggregates of 0.5–2 μm	Different mass aggregates in the 0.5–2 μm range
Shape of the particles	Mainly semi-spherical	Mainly semi-spherical	Clustered. Ellipsoidal and amorphous-like aggregates	Mass aggregates
Particle distribution	Nanoparticles were unevenly distributed. Larger particles showed a homogeneous mass distribution	Nanoparticles were unevenly distributed. Larger particles showed a homogeneous mass distribution	Uneven distribution of the mass within the aggregate body	Uneven mass distribution within the aggregate body

Compared to the control, the sample sprayed 4 times showed minor changes to the morphology and matrix structure. By contrast, the samples sprayed 10 and 14 times showed substantial changes to the morphology and matrix structure, with differences mainly in the type of particles observed. In the control and 4-sprayed samples, the main components were semi-spherical individual nanoparticles and sub-micrometer particles, whereas in the samples sprayed 10 and 14 times, ellipsoidal nanoparticles were grouped in large clusters and micrometer-sized mass aggregates were observed (Table 3) *(details presented in Supplementary Text T2).*

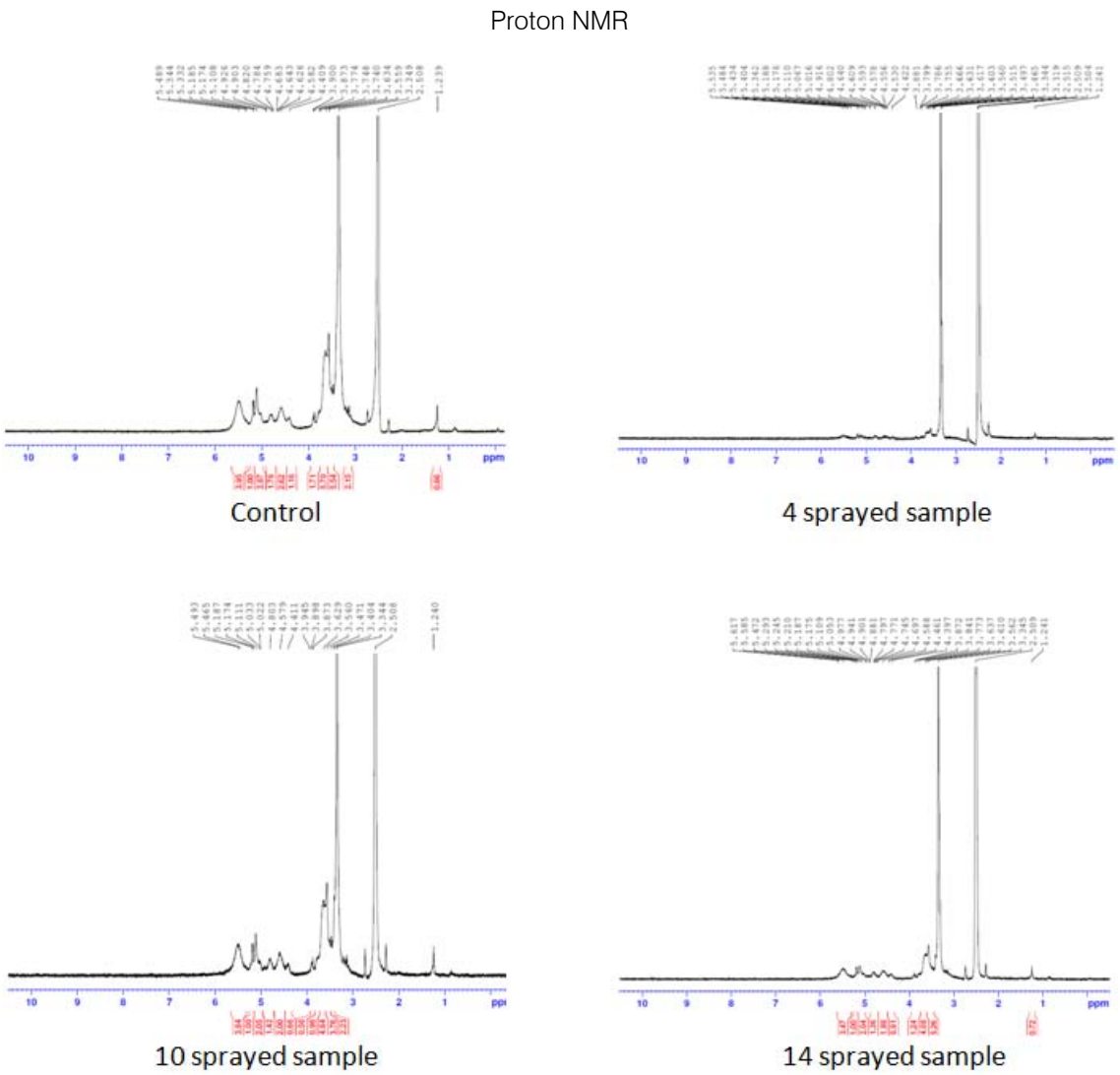

Fig. 5: 1H-NMR of complementary baby food

The intensity of the peak at δ 3.90–6.00 was due to the –OH and –NH protons of the sugar ring, and that at δ 1.068–1.103 was due to the β-hydroxy butyrate group. This group has potent anti-inflammatory property, hence useful in inflammatory bowel disease and irritable bowel syndrome. This peak was notable in the sample sprayed10 times, small in the sample sprayed 14 times, and absent in the sample sprayed4 times (Figure 5). These differences in peak intensities were related to the varying protein solution concentration that resulted from the changes induced by MIRGA spraying *(details are presented in Supplementary Text T3).*

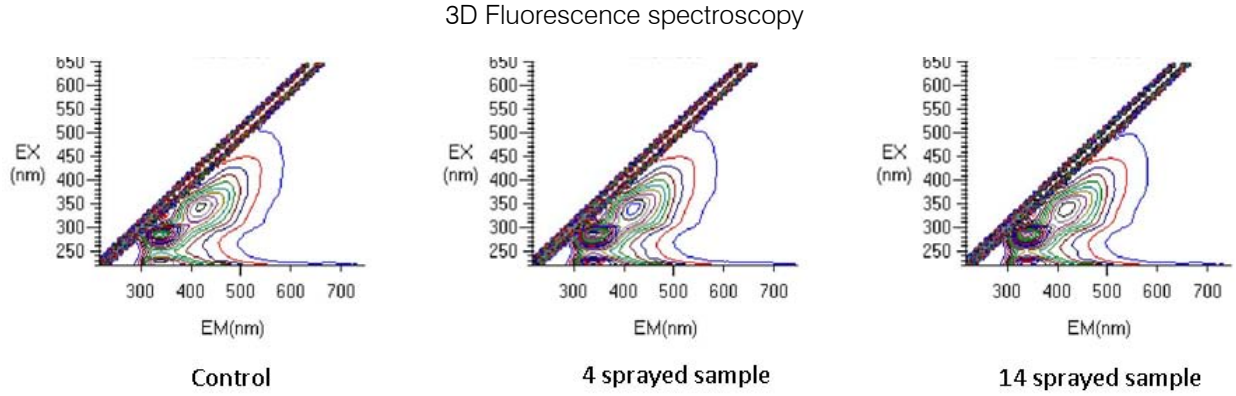

Fig. 6: 3D Fluorescence spectroscopy of complementary baby food

The samples were fluorescence active. A Rayleigh scattering peak ($\lambda_{ex}=\lambda_{em}$) was observed in all spectra. The increased fluorescence intensity in the sample sprayed14 times was due to the spectral behavior of the tryptophan residues that were formed as a result of the unfolding of the protein *(Kazlauskas, 2018; Rumbley et al., 2001)* (Figure 6). Tryptophan is useful for *in vivo* synthesis of proteins, to cure of autism, cognitive dysfunction, cardiovascular and kidney diseases, inflammatory bowel diseases and induce sleep, etc.

MIRGA and mid-infrared irradiation

The concept of MIRGA is based on the action of the2–6 μm mid-IR irradiation on the chemical bonds of coffee, tea, cocoa powder, edible salt and terminalia as described in previous studies conducted by our team *Umakanthan et al., 2022a; Umakanthan et al., 2022b; Umakanthan et al., 2023c; Umakanthan et al., 2023d (a detailed discussion is presented in Supplementary Text T4)*.

Action of MIRGA-emitted 2–6 μmmid-IR on baby food

The laboratory analyses described above showed that the C–N and C–O bond stretching, formation of new molecules, lactose breakage, increased crystallinity, and configurational changes were responsible for the improved quality of the baby food. The applied mid-IR is absorbed by the carbohydrates, protein, fat, and water in the food. The vibrational frequencies of these molecules correspond to this wavelength *(Toor et al., 2018),* thus resulting in photostimulation and photobiomodulation *(Pollack, 2015).* These phenomena lead to changes in the vibrational modes of the molecules (e.g., stretching) *(Mohan, 2004; Shankar, 2017)* and chemical compound transformation *(Xu et al., 2017),* ultimately altering the physical and chemical properties *(Yi, 2012; Atkins et al., 2011)* of the food. Thus, the favorable organoleptic and biochemical changes corresponded to the number of sprayings occurred.

FTIR analysis revealed that the reduction of disulfide bonds results in health benefits *(Mossuto, 2013).* Moreover, the breakage of lactose into glucose ad galactose increased the sweetness of the food. Fetuses *(Hayes et al., 2017),* infants, and children naturally prefer the sweet taste *(Murray, 2017)* so sweeter baby food is expected to be more appealing to infants.

The formed lactose-free by-product is suitable for lactose-intolerant infants and is also an affordable alternative to Maltodex *(Maldonado et al., 1998; Hofman et al., 2015)* as well as a therapeutic agent against diarrhea in children *(Sethi et al., 2018).* As evidenced by the PXRD analysis, increased crystallinity is an added value to the manufacturer and consumer. 3D fluorescence spectroscopy revealed the unfolding of protein as a result of the MIRGA spraying, with more sprayings resulting in greater unfolding. By contrast, FTIR revealed that 4 spraying preserved the protein structure. Based on our experience, we consider the complementary baby food enhanced by MIRGA spraying can be used in addition to breast milk feeding when the latter is insufficient. Also based on our experience in this research and unrevealed results in this paper, we humbly request feeding mothers to feed babies with the mother's milk or on deficit the cow milk especially milk of native cows or the MIRGA sprayed complementary baby foods.

V. Conclusion

Complementary baby food was irradiated with 2–6μm mid-infrared. Sensory and instrumental analyses revealed that mid-IR irradiation favorably altered the chemistry of complementary baby food, thereby improving the aroma, texture, nutritional, and health benefits of the baby food. This technology can be used in the future to enhance the quality and sensory attributes of similar products.

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Author contributions

Umakanthan: Conceptualization, Methodology, Supervision, Validation.
Madhu Mathi: Data curation, Investigation, Visualization, Writing - Original draft preparation.
Umadevi: Project administration, Resources
Umakanthan, Madhu Mathi: Writing- Reviewing and Editing.

Conflict of interest

In accordance with the journal's policy and our ethical obligation as researchers, we submit that the authors Dr. Umakanthan and Dr. Madhu Mathi are the inventors and patentee of Indian patent for MIRGA *(under-patent no.: 401387)* which is a major material employed in this study.

Data and materials availability

All data is available in the manuscript and supplementary information.

References Références Referencias

1. Institute of medicine: Nutrition During Lactation. Washington, DC, National Academy press, 1991.
2. Picciano, M.F. Nutrient composition of human milk. Pediatric Clin. North Am. 4853-67, 2001.
3. Dewey, K.G. (2001). Nutrition Growth and Complementary feeding of The Breast Feed Infant. Pediatric clinics of North America, 48(1), 87-104; doi: 10.1016/s0031-3955(05) 70287-X
4. Murray, R. D. (2017). Savoring Sweet: Sugars in Infant and Toddler Feeding. Annals of Nutrition and Metabolism, 70(3), 38–46. doi:10.1159/000479246

5. Mohamed, E., Adel, Alajtal., Nada, Alsedawi., H., G., M., Edwards. (2018). Nutritional Evaluation of Some Commercial Infant Formula Consumed in Misurata-Libya. doi: 10.26538/TJNPR/V2I1.11
6. Pereira M F, Shulika O, 2011. Terahertz and MidInfrared Radiation: Generation, Detection and Applications. Springer Science + Business Media B.V., The Netherlands. DOI: 10.1007/978-94-007-0769-6.
7. Umakanthan, Mathi M, 2022a. Decaffeination and improvement of taste, flavor and health safety of coffee and tea using mid-infrared wavelength rays. Heliyon, e11338, Vol 8(11). doi: 10.1016/j.heliyon.2022.e11338
8. Umakanthan T, Mathi M, 2022b. Quantitative reduction of heavy metals and caffeine in cocoa using mid-infrared spectrum irradiation. Journal of the Indian Chemical Society, Vol 100 (1). doi: 10.1016/j.jics.2022.100861.
9. Umakanthan, T., &Mathi, M. (2023c). Increasing saltiness of salts (NaCl) using mid-infrared radiation to reduce the health hazards. Food Science & Nutrition, 11, 3535–3549. https://doi.org/10.1002/fsn3.3342
10. Umakanthan, Madhu Mathi, 2023d. Potentiation of Siddha medicine using Muppu (Universal Potentiator). International Journal of Pharmaceutical Research and Applications Volume 8, Issue 4 July-Aug 2023, pp: 2070-2084.
11. Everitt, M. (2009). Consumer-Targeted Sensory Quality. Global Issues in Food Science and Technology, 117–128. doi:10.1016/b978-0-12-374124-0.00008-9.
12. Wichchukit S, O'Mahony M. (2014). The 9-point hedonic scale and hedonic ranking in food science: some reappraisals and alternatives. Journal of the Science of Food and Agriculture, 95(11), 2167–2178. doi:10.1002/jsfa.6993
13. Hameed, I., Altameme, H., & Mohammed, G. (2016). Evaluation of Antifungal and Antibacterial Activity and Analysis of Bioactive Phytochemical Compounds of Cinnamomum Zeylanicum (Cinnamon Bark) using Gas Chromatography-Mass Spectrometry. Oriental Journal of Chemistry, 32(4), 1769–1788. doi:10.13005/ojc/320406
14. Mustapha N. Abubakar and Runner R. T. Majinda. GC-MS Analysis and Preliminary Antimicrobial Activity of Albiziaadianthifolia (Schumach) and Pterocarpusangolensis (DC). Medicines 2016, 3, 3; doi: 10.3390/medicines3010003
15. Helioswilton S C, de Souza P R, Peghini B C, da Silva J S, Cardoso C R. An Overview of the Modulatory Effects of Oleic Acid in Health and Disease. Mini-Reviews in Medicinal Chemistry, 2013, 13, 000-000
16. Zárate, R., el Jaber-Vazdekis, N., Tejera, N., Pérez, J. A., & Rodríguez, C. (2017). Significance of long chain polyunsaturated fatty acids in human health. Clinical and Translational Medicine, 6(1). doi:10.1186/s40169-017-0153-6.
17. Hoppenbrouwers, T., CvejćHogervorst, J. H., Garssen, J., Wichers, H. J., &Willemsen, L. E. M. (2019). Long Chain Polyunsaturated Fatty Acids (LCPUFAs) in the Prevention of Food Allergy. Frontiers in Immunology, 10. doi: 10.3389/fimmu.2019.01118.
18. Larodan Research Grade Lipids, https://www.larodan.com/product/13z-octadecenoic-acid/
19. Human Metabolome Database, http://www.hmdb.ca/metabolites/HMDB0041480
20. Kilcawley K N, Mannion D T, (June 21st 2017). Free Fatty Acids Quantification in Dairy Products, Fatty Acids, Angel Catala, IntechOpen, DOI: 10.5772/intechopen.69596. Available from: https://www.intechopen.com/books/fatty-acids/free-fatty-acids-quantification-in-dairy-products.
21. Aleksandra, A., Ana, Stojanovic., Milena, Mikic. (2019). Oleic Acid - Health Benefits and Status in Plasma Phospholipids in the Serbian Population. Serbian Journal of Experimental and Clinical Research, doi: 10.1515/SJECR-2017-0077
22. Anka, T, Petkoska., Anita, Trajkovska-Broach. (2021). Health Benefits of Extra Virgin Olive Oil. doi: 10.5772/INTECHOPEN.96570
23. Merck & Co. Inc. 2020. "You Can Control Your Cholesterol: A Guide to Low-Cholesterol Living". Archived from the original on 2009-03-03. Retrieved 2009-03-14.
24. Rumbley, J., Hoang, L., Mayne, L., & Englander, S. W. (2001). An amino acid code for protein folding. Proceedings of the National Academy of Sciences, 98(1), 105–112. doi: 10.1073/pnas.98.1.105
25. Kazlauskas, R. (2018). Engineering more stable proteins. Chemical Society Reviews. doi: 10.1039/c8cs00014j
26. A., E., Vernikovskaya.,Nitzan, Dubovski., Yaron, Ben, Shoshan-Galeczki., Einav, Malach., Masha, Y., Niv. (2022). Taste and chirality: l-glucose sweetness is mediated by TAS1R2/TAS2R3 receptor. Food Chemistry, doi: 10.1016/J.FOODCHEM.2021.131393
27. Herman F. Mark, Encyclopedia of Polymer Science and Technology, Concise, 3rd edition, John Wiley & Sons, 2007.
28. Toor F, Jackson S, Shang X, Arafin S, Yang H. Mid-infrared Lasers for Medical Applications: introduction to the feature issue. Biomed Opt Express. 2018 Nov 15; 9(12): 6255-6257. doi: 10.1364/BOE.9.006255. PMID: 31065426; PMCID: PMC6491011.
29. Pollack G H. (2015). Cell Electrical Properties: Reconsidering the Origin of the Electrical Potential. Cell Biology International. 39. 10.1002/cbin.10382.

30. Mohan J. Organic Spectroscopy: Principles and Applications, 2nd edition, Alpha science international Ltd., Harrow, UK, 19, (2004). Available at: https://books.google.co.in/books?id=fA08Uy5DR0QC&printsec=frontcover&dq=Jag+Mohan.+Organic+Spectroscopy:+Principles+and+Applications&hl=en&sa=X&ved=0ahUKEwjHpcHUi9fgAhXXFIgKHXvRCpIQ6AEIKjAA#v=onepage&q=Jag%20Mohan.%20Organic%20Spectroscopy%3A%20Principles%20and%20Applications&f=false
31. Shankar D R, 2017. Remote Sensing of Soils. Germany: Springer-Verlag GmbH, p268.
32. Xu R, Xu Y, 2017. Modern Inorganic Synthetic Chemistry, 2nd edn., Elsevier B.V, Netherlands, UK, USA, p124.
33. Yi G C, 2012. Semiconductor Nanostructures for Optoelectronic Devices: Processing, Characterization and Applications. Berlin, Heidelberg: Springer-Verlag, p198.
34. Atkins P, Paula J, 2011. Physical Chemistry for the Life Sciences, Oxford university press, Oxford, p365.
35. Mossuto, M. F. (2013). Disulfide Bonding in Neurodegenerative Misfolding Diseases. International Journal of Cell Biology, 2013, 1–7. doi:10.1155/2013/318319.
36. Hayes, J. E., & Johnson, S. L. (2017). Sensory Aspects of Bitter and Sweet Tastes During Early Childhood. Nutrition Today, 52(Supplement), S41–S51. doi:10.1097/nt.0000000000000201.
37. Maldonado, J., Gil, A., Narbona, E., & Molina, J. A. (1998). Special formulas in infant nutrition: a review. Early Human Development, 53, S23–S32. doi:10.1016/s0378-3782(98)00062-0.
38. Hofman, D. L., van Buul, V. J., & Brouns, F. J. P. H. (2015). Nutrition, Health, and Regulatory Aspects of Digestible Maltodextrins. Critical Reviews in Food Science and Nutrition, 56(12), 2091–2100. doi:10.1080/10408398.2014.940415.
39. Sethi, G., Sankaranarayanan, S., & Sukhija, M. (2018). Low lactose in the nutritional management of diarrhea: Case reports from India. Clinical Epidemiology and Global Health. Vol 6 (4), pg 160-162. doi:10.1016/j.cegh.2018.02.002.

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Supplementary Data

D1: Raw data files of Complementary baby food instrumentations
https://drive.google.com/open?id=1Y31W6KDDz3jveY2GPB8P3x3U4-T8KEw8

Supplementary video:

V1: Method of spraying
https://drive.google.com/open?id=1QoRwTESKfSdoJTfD--xlG9YpTDnVonGW

Supplementary Text

T1:

MIRGA *(under-patent no.: 401387)*is a 20-mL capacity polypropylene plastic atomizer containing an inorganic (molar mass 118.44 g/mole) water-based solution. The sprayer unit has dimensions 86 × 55 × 11 mm, an orifice diameter of 0.375 mm, ejection volume 0.062 ± 0.005 mL, and ejection time 0.2 s. The average pressure is 3900 Pa, and the cone liquid back pressure is 2000 N/m^2. During spraying, approximately 1-μg weight of water is lost as mist and the non-volatile material in the sprayed liquid has a concentration of 153 mg/mL. Depending on the pressure applied to the plunger, every spraying is designed to generate 2–6 *μ*m as estimated by an FTIR (retro-reflector) interferometer instrument (Detector type D* [cm HZ1/2 - 1] MCT [2-TE cooled]) at Lightwind, Petaluma, CA, USA.

Raw data files for estimation of 2-6 μm mid-IR generated from MIRGA while spraying: https://drive.google.com/open?id=1zTiqlOIWVgpaTsiEFqGeyvDM62juHM06

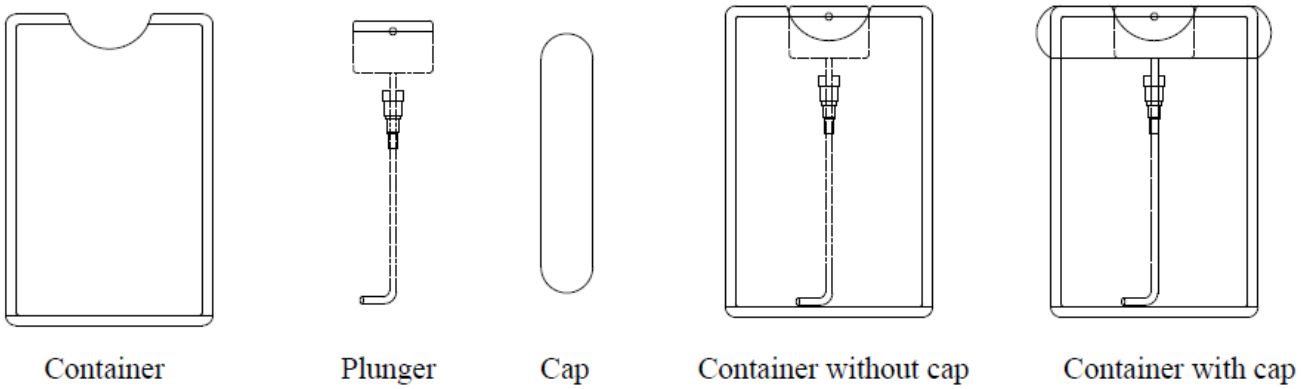


Fig: Parts of the MIRGA sprayer

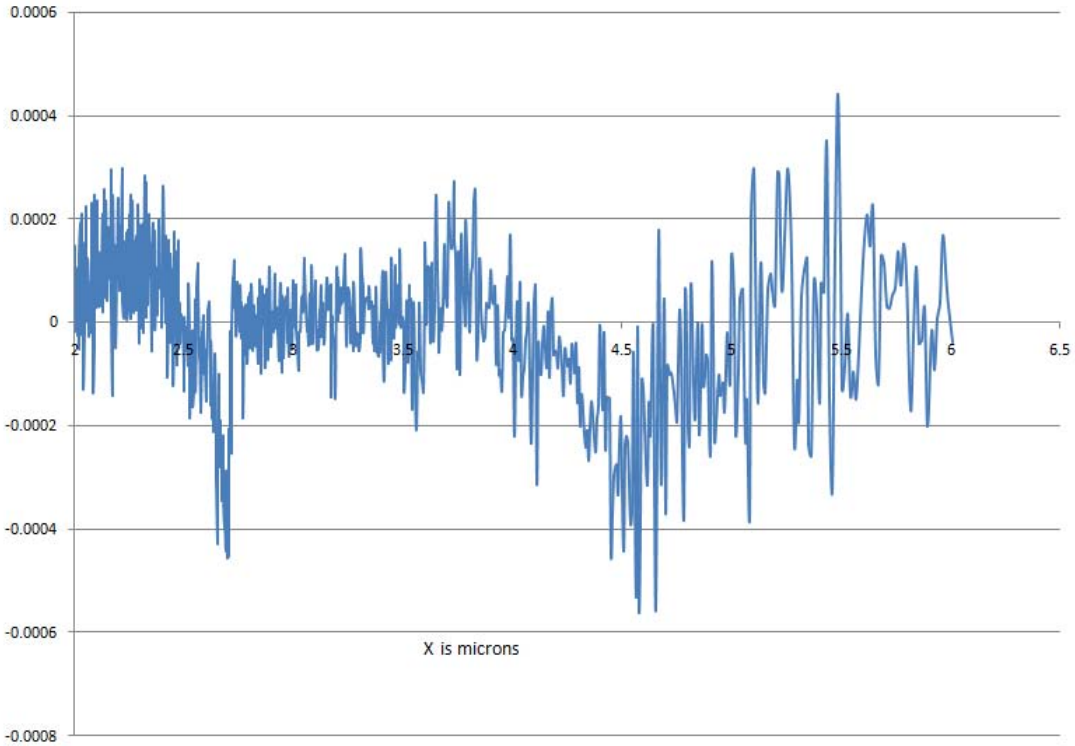


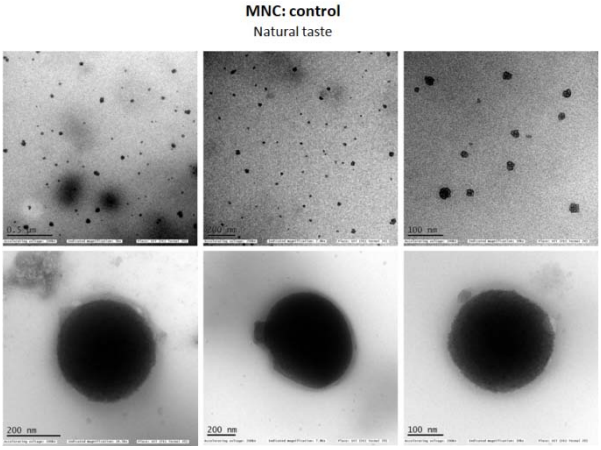
Fig: Estimation of 2-6 μm mid-infrared while spraying MIRGA atomizer

Supplementary text

T2: Detailed TEM interpretation

Bright-field images

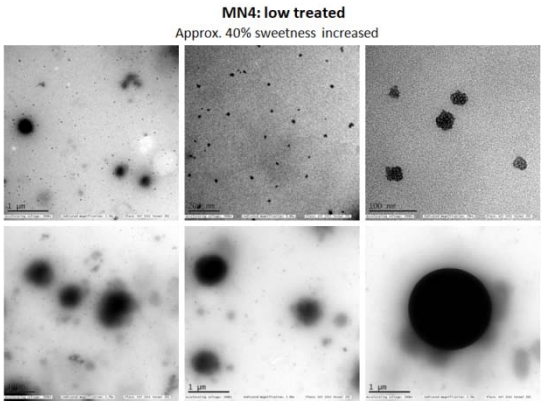
Control sample:



Top row images: nanoparticles. Bottom row images: submicron particles.

The control sample is mainly composed of particles, either in the nanometer (images in top row) and in the submicrometer (images in bottom row) ranges. Both particle types appear not clustered, each other or to other components, and show mainly semi-spherical shape. Size ranges are 10 – 30 nm for nanoparticles, and 300 – 400 nm for larger particles. Besides the size, main difference between the two types concerns the uniformity of distribution of the particle mass within particle body. In the nanoparticles the mass appear unevenly distributed, as it is mostly visible in top right image. Viceversa, larger particles show homogeneous mass distribution, as clearly documented by bottom row images. Dark appearance of particles has to be related to mass contrast, since the control sample has amorphous structure.

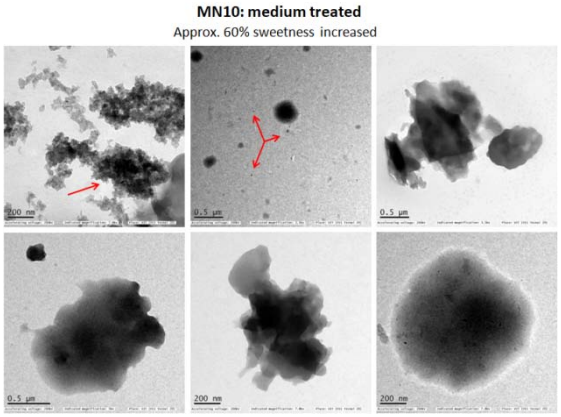
4 sprayed sample:



Top row images: nanoparticles. Bottom row images: particles in the submicrometer (left, central) and above-micrometer (right) ranges.

In the 4 sprayed sample the overall morphology of the control sample is preserved, indicating that the 4 sprayings does not affect heavily the sample matrix. It is mainly composed of particles, either in the nanometer (images in top row) and in the submicrometer (images in bottom row) ranges. Similarly to control, both particle types appear not clustered to other components, and show mainly semi-spherical shape. Size ranges are 10 – 30 nm for nanoparticles, and 100 – 400 nm for larger ones. An example of the combined presence of the two size ranges is given in top left image, where both nanoparticles and submicrometer particles are visible. However, differently from the control, larger particles are also observed, like the one in bottom right image, ranging 1 – 2 μm. Similarly to control, main difference between nanoparticles and larger particles concerns the distribution of mass within particle body. In the nanoparticles the mass appear unevenly distributed, as it is clearly visible in top right image. Viceversa, larger particles show homogeneous mass distribution, as clearly documented by bottom row images. Dark appearance of particles has to be related to mass contrast, since the 4 sprayed sample has amorphous structure.

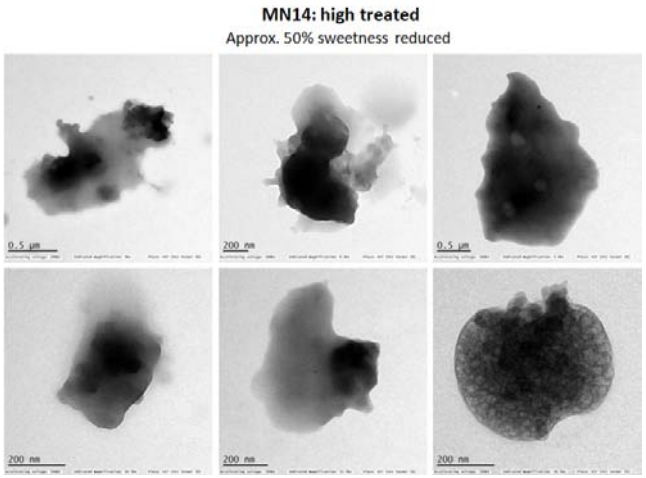
10 sprayed sample:



Top row images: clusters of nanoparticles (left), Bottom row images: particles in the submicrometer range (central), cluster of mass aggregates (right).

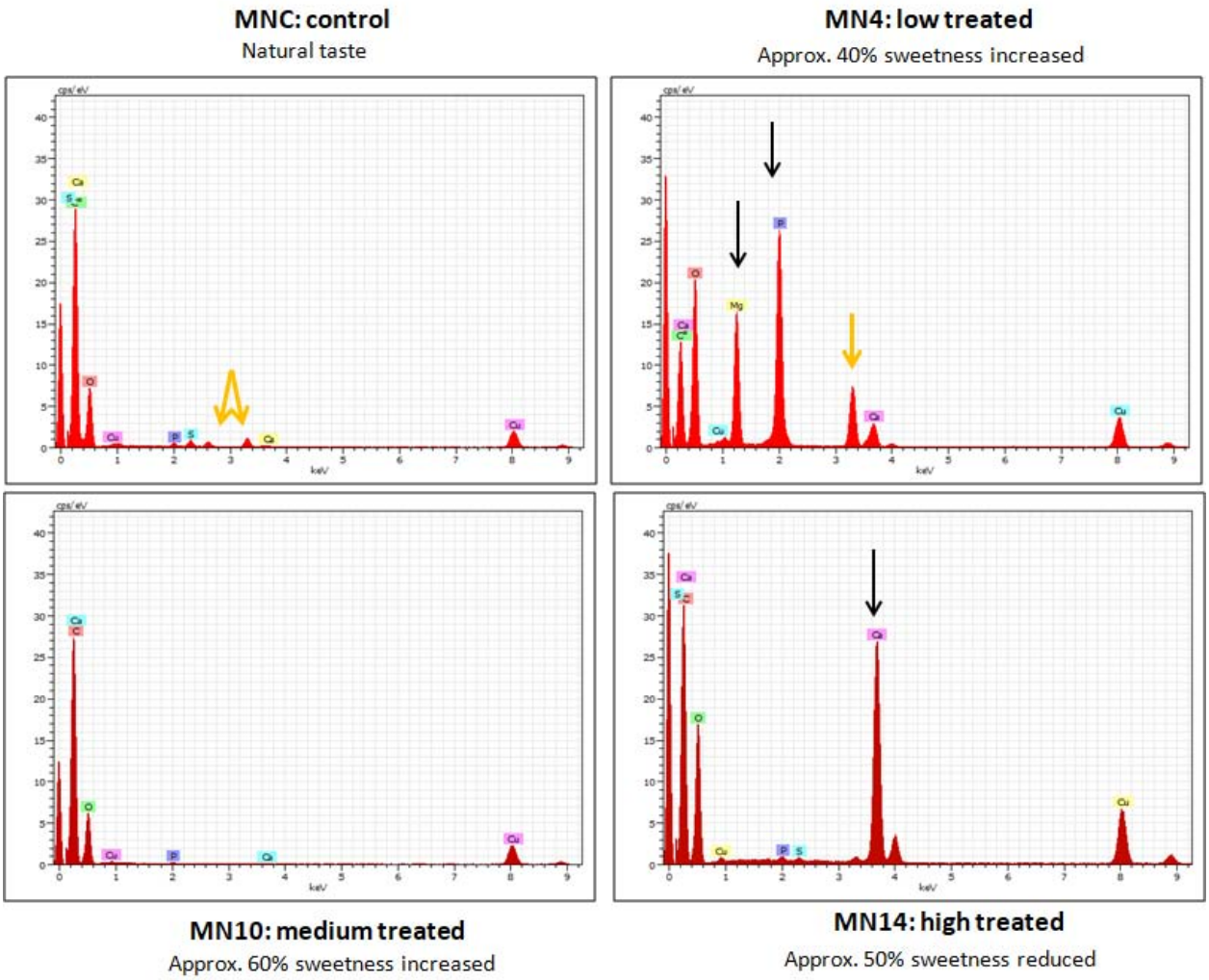
Semi-spherical nanoparticles similar to those observed in the control and 4 sprayed samples are anyway also visible in the 10 sprayed sample, like those indicated by arrows in the top central image. Amorphous-like aggregates of material range 0.5 – 2 μm size; they are observed either in clusters (top right image), or individually (bottom images). The inhomogeneous distribution of dark areas observed on these aggregates suggests an uneven distribution of mass within the aggregate body. Indeed, since also the 10 sprayed sample has non crystalline structure, dark areas have to be related to mass contrast effects.

14 sprayed sample:



Top and bottom row images: different mass aggregates observed in this sample.

Differently from previously discussed samples, in the 14 sprayed sample the matrix structure and morphology of control is not preserved, indicating that also the 14 sprayings affects significantly the sample matrix itself. Neither nanoparticles, nor larger semi-spherical particles, are generally visible from available images, while mass aggregates are widely documented, suggesting that this type of materials are far more abundant than in previously discussed samples, with the partial exception of the medium treated one. Mass aggregates show similar size range than those of 10 sprayed sample. Similarly to the latter, also, a clearly inhomogeneous distribution of dark areas is observed on these aggregates, that suggests an uneven distribution of mass within the aggregate body. Indeed, since also the 14 sprayed sample has non crystalline structure, dark areas have to be related to mass contrast effects. Finally, a sponge-like mass distribution is observed in bottom right image that is not visible in previous samples.



MNC: control
Natural taste

Spectrum: Spectrum 455-MNC

Element	Series	Net unn. C [wt.%]	norm. C [wt.%]	Atom. C [at.%]	Error (3 Sigma) [wt.%]
Oxygen	K-series	30331	3.59	3.59	2.78	0.40
Carbon	K-series	113161	93.88	93.88	96.64	8.57
Phosphorus	K-series	2205	0.15	0.15	0.06	0.09
Sulfur	K-series	4244	0.28	0.28	0.11	0.10
Copper	K-series	19011	2.01	2.01	0.39	0.26
Calcium	K-series	1195	0.08	0.08	0.03	0.09
	Total:		100.00	100.00	100.00	

MN4: low treated
Approx. 40% sweetness increased

Spectrum: Spectrum 456-MN4

Element	Series	Net unn. C [wt.%]	norm. C [wt.%]	Atom. C [at.%]	Error (3 Sigma) [wt.%]
Oxygen	K-series	36194	14.37	14.37	13.77	1.39
Carbon	K-series	20457	56.87	56.87	72.60	5.33
Phosphorus	K-series	62247	14.35	14.35	7.10	1.38
Copper	K-series	14703	5.21	5.21	1.26	0.56
Calcium	K-series	8926	2.12	2.12	0.81	0.28
Magnesium	K-series	32221	7.08	7.08	4.46	0.72
	Total:		100.00	100.00	100.00	

Spectrum: Spectrum 457-MN10

Element	Series	Net unn. C [wt.%]	norm. C [wt.%]	Atom. C [at.%]	Error (3 Sigma) [wt.%]
Carbon	K-series	125442	94.23	94.23	97.01	8.59
Oxygen	K-series	29842	3.20	3.20	2.47	0.37
Phosphorus	K-series	851	0.05	0.05	0.02	0.08
Calcium	K-series	539	0.03	0.03	0.01	0.08
Copper	K-series	25958	2.48	2.48	0.48	0.30
	Total:		100.00	100.00	100.00	

MN10: medium treated
Approx. 60% sweetness increased

Spectrum: Spectrum 458-MN14

Element	Series	Net unn. C [wt.%]	norm. C [wt.%]	Atom. C [at.%]	Error (3 Sigma) [wt.%]
Carbon	K-series	48868	77.83	77.83	89.62	7.16
Oxygen	K-series	28455	6.47	6.47	5.59	0.67
Phosphorus	K-series	845	0.11	0.11	0.05	0.09
Sulfur	K-series	564	0.07	0.07	0.03	0.09
Calcium	K-series	76680	10.45	10.45	3.61	1.02
Copper	K-series	24936	5.06	5.06	1.10	0.54
	Total:		100.00	100.00	100.00	

MN14: high treated
Approx. 50% sweetness reduced

To summarize, with respect to the control sample, 4 spraying affected the sample with minor changes of morphology and matrix structure. Conversely, both 10 and 14 sprayings affected significantly the sample morphology and matrix structure, with differences mainly in the type of particles observed: semi-spherical individual nanoparticles and submicrometer particles are observed as main

components of the control and 4 sprayed samples, while ellipsoidal nanoparticles grouped in large clusters and above-micrometer mass aggregates are observed in the 10 and 14 sprayed samples.

Supplementary text

T3: Detailed 1H-NMR interpretation

Control

δ 0.50-2.70). This is due to Aliphatic group.
δ 1.068-1.103.This is due to-β hydroxybutyrate GROUP.
δ 2.508 This is due to DMSO-d6.
δ 3.372.This is due to H2O peak.
δ 2.70-3.90.This is due to sugar ring and residual water proton.
δ 3.90-6.00This is due to sugar ring –OH and –NH protons.
δ 5.12-5.96.This is due to CARBOHYDRAT anomeric proton.

4 sprayed

δ 0.50-2.70). This is due to Aliphatic group.
δ 1.068-1.103.This is due to-β hydroxybutyrate GROUP.(Intensity is very less in comparision to control)
δ 2.508 This is due to DMSO-d6.
δ 3.372.This is due to H2O peak.
δ 2.70-3.90.This is due to sugar ring and residual water proton.
δ 3.90-6.00This is due to sugar ring –OH and –NH protons.(This is absent in this sample)
δ 5.12-5.96.This is due to CARBOHYDRAT anomeric proton.(This peak is absent)

10 sprayed

δ 0.50-2.70). This is due to Aliphatic group.
δ 1.068-1.103.This is due to-β hydroxybutyrate GROUP.
δ 2.508 This is due to DMSO-d6.
δ 3.372.This is due to H2O peak.
δ 2.70-3.90.This is due to sugar ring and residual water proton.
δ 3.90-6.00This is due to sugar ring –OH and –NH protons.
δ 5.12-5.96.This is due to CARBOHYDRAT anomeric proton.

14 sprayed

δ 0.50-2.70). This is due to Aliphatic group.
δ 1.068-1.103.This is due to-β hydroxybutyrate GROUP.
δ 2.508 This is due to DMSO-d6.
δ 3.372.This is due to H2O peak.
δ 2.70-3.90.This is due to sugar ring and residual water proton.
δ 3.90-6.00This is due to sugar ring –OH and –NH protons.
δ 5.12-5.96.This is due to CARBOHYDRAT anomeric proton.

Supplementary text

T4: Detailed discussion

1. *Detailed discussion [1]*

1.1. Invention background

The four observable states of matter (solid, liquid, gas, and plasma) are composed of intermolecular and intramolecular bonds. The inherent characteristics of neutrons, protons and electrons are unique, however, differences in their numbers are what constitute different atoms, and how these atoms bind together develops into different molecules with unique characteristics. In the electromagnetic wave (EMW) spectrum, the mid-IR region is vital and interesting for many applications since this region coincides with the internal vibration of most molecules [2]. Almost all thermal radiation on the surface of the Earth lies in the mid-IR region, indeed, 66% of the Sun's energy we receive is infrared [3] and is absorbed and radiated by all particles on the Earth. At the molecular level, the interaction of mid-IR wavelength energy elicits rotational and vibrational modes (from about 4500–500 cm^{-1}, roughly 2.2 to 20 microns) through a change in the dipole movement, leading to chemical bond alterations [4].

During our research we have observed: *(A)* In all objects, even though atoms always remain as atoms, their chemical bond parameters are continuously prone to alteration by cosmic and physical energies (e.g.: EMW, heat, pressure, and humidity) causing the bonds to compress/stretch/bend [5-8], break [9,10], or new bonds to be formed [11]. These alterations ultimately lead to changes in the physicochemical characteristics of the objects. *(B)* The dynamic, constant, and mutual influences of EMW among the Earth and the celestial and living bodies are continuously causing alterations in the inherent physiochemical characters of earthly objects, for instance, enhancement due to an optimum

dose of energy or decrease/destruction due to a high dose of energy (detailed below). Thus, based on these concepts, MIRGA was developed to alter the bond parameters, thereby potentiating the natural characteristics of products.

1.2. MIRGA definition

We define MIRGA as *'a harmless, economical atomizer containing an imbalanced ratio of ions suspended in water, which influence the natural potency of target substances by generating mid-IR while spraying'*.

1.3. Technique of mid-IR generation from MIRGA

We designed MIRGA as to accommodate an imbalanced ratio of ions suspended in water in their fundamental state, which can move as free particles. The solution exhibits very little detectable background frequency, below even that of cosmic events. By comparison humans emit more radioactivity (around 10 microns) [12,13]. We designed MIRGA to generate energy based on various processes such as: (A) spraying leads to ionization (electrons getting separated from atoms) and many pathways for electron re-absorption; due to these two oscillatory processes, energy is generated; (B) while spraying, a water-based ionic solution gets excited/charged, which in turn leads to oscillation among the imbalanced ions [14] in their excited state, resulting in the emission of photons [15,16]; (C) although a low electromagnetic field exists between the charged particles of the MIRGA's ionic solution, during spraying the induced oscillation between these charged particles produces energy [17-21]; and (D) in the natural rainfall process, more energy is required to break the water bonds for creating smaller water droplets [22]. Therefore, these droplets should have more stored energy, which then travels down at velocity from a specific distance, thus gaining kinetic energy. When the rain hits the Earth's surface, it forms a very thin film of mid-IR (nearly 6 micron), hence there is a net heat gain [22,23]. We simulated this rainfall's energy-gaining process in MIRGA(i.e., when imbalanced ions in liquid media are atomized, the ejected smaller droplets should have higher internal energy as well as acquired kinetic energy, and the energy emitted by breaking the surface tension). From trial and error, we calibrated the ejection pressure to obtain a desired fine mist, and minimized the evaporation rate by altering the pH and density of the solution. Moreover, the accelerated ions in the sprayed ionic clouds collide among themselves and generate energy [24], thus, we incorporated these phenomena in our atomizer and designed it in such a way as to emit energy in the 2–6 μm mid-IR depending on the given plunger pressure.

Yousif et al. [25] described this process as a photo dissociation of molecules caused by the absorption of photons from sunlight, including those of infrared radiation, visible light, and ultraviolet light, leading to changes in the molecular structure.

1.4. Safety of MIRGA-sprayed products

In our nearly two-decades of research, we have observed that MIRGA-induced bond-altered target substances do not show any adverse reaction upon consumption/use. In nature, *(A)* Stereochemical configuration has great influence on taste [26] (e.g., varieties of mango, grapes, rice, etc.), *(B)* Cooking and digestive enzymes break chemical bonds, thereby softening foods. This indicates that alterations in chemical bonds occur naturally and do not represent a risk to human health. As an example, boiledrice, puffed rice, flat rice, and rice flour have a unique aroma, taste, texture, and shelf-life but conserving the same molecular formula ($C_6H_{10}O_5$). *(C)* In the food industry, sensory attributes and shelf-life are enhanced by altering the food's chemical bonds using various irradiation processes like radappertization, radicidation, and radurization [27]. *(D)* Uponheating, water changes from ice to liquid to steam, which are manifestations of changes in the hydrogen bonds [28] but the chemical composition (H_2O) remains the same [29].

1.5. MIRGA's primeval and future scope

The water-based MIRGA could be the first novel potentiating technology. This type of atomizer technology also seems to be present with the extra-terrestrials for their therapeutic use during visitations [30].

In various products, we have achieved a range from 30% to 173% potentiation. Even the smaller improvement resulted in 30% monetary and resource savings as well as health benefits. However, there is a knowledge gap between potentiation from 30% to at least 100% for all products, which can be filled-up by refining MIRGA's ionic solution, concentration, atomizer pressure, and other parameters and even formulating a better solution.

Various mid-IR emitters are now available (e.g., silicon photonic devices [31], cascade lasers quantum and interband [32], non-cascade-based lasers, chalcogenide fiber-based photonic devices [33], and suspended-core tellurium-based chalcogenide fiber photonic devices [34]). These emitters are not as cost-effective as MIRGA and are useful only in astronomy, military, medicine, industry, and research applications. These emitters are too complex for domestic application by the average user.

Because of MIRGA's wide range of applications, we believe that this technique will resonate in many scientific fields including biophotonics, therapeutics, health, ecology, and others. We are currently conducting research on MIRGA and its applications, namely MIRGA salt, MIRGA vapor and MIRGA plasma.

References Références Referencias

1. Umakanthan, Mathi M, 2022. Decaffeination and improvement of taste, flavor and health safety of coffee and tea using mid-infrared wavelength rays. Heliyon, e11338, Vol 8(11). doi: 10.1016/j.heliyon.2022.e11338
2. CORDIS, European commission. New advances in mid-infrared laser technology, Compact, high-energy, and wavelength-diverse coherent mid-infrared source. Available at: https://cordis.europa.eu/project/rcn/99977/brief/en (last accessed on 27.01.2019)
3. A. Salam, A. Ammar, A.H. Asaad, L. Yi-Chen, C. Francesco, 2019. Molecules A Comprehensive Review on Infrared Heating Applications in Food Processing. Molecules. 24, 2-21. doi: 10.3390/molecules24224125.
4. J. E. Girard, Principles of Environmental Chemistry, third ed., Jones & Bartlett Learning, USA, 2014, pp. 99.
5. James E. Girard, 2014. Principles of Environmental Chemistry, 3rd edition, Jones & Bartlett Learning, USA, p99
6. Avelion Alvarez and Miguel Prieto, 2012. Fourier Transform Infrared spectroscopy in Food Microbiology, Springer Science & Business Media, p3.
7. Brian C. Smith. Infrared Spectral Interpretation: A Systematic Approach, CRC Press, LLC, 7, (1999)
8. Dwivedi Ravi Shankar, 2017. Remote Sensing of Soils. Germany: Springer-Verlag GmbH, p268
9. Jag Mohan. Organic Spectroscopy: Principles and Applications, 2nd edition, Alpha science international Ltd., Harrow, UK, 19, (2004). Available at: https://books.google.co.in/books?id=fA08Uy5DR0QC&printsec=frontcover&dq=Jag+Mohan.+Organic+Spectroscopy:+Principles+and+Applications&hl=en&sa=X&ved=0ahUKEwjHpcHUi9fgAhXXFIgKHXvRCpIQ6AEIKjAA#v=onepage&q=Jag%20Mohan.%20Organic%20Spectroscopy%3A%20Principles%20and%20Applications&f=false
10. Carolyn McMakin, 2011. Frequency specific Microcurrent in pain management E-book, Elsevier, China, p 30.
11. David Moss, 2011. Biomedical Applications of Synchrotron Infrared Microspectroscopy: A Practical Approach, Royal Society of Chemistry, UK, p 58.
12. Peter H. Raven, Linda R. Berg, David M. Hassenzahl, 2012. Environment, John Wiley & Sons, Inc., USA, p45. Available at: https://books.google.co.in/books?id=QVpO2R51JBIC&pg=RA1-PA45&dq=electromagnetic+waves+make+form+new+bonds&hl=en&sa=X&ved=0ahUKEwiTnO2amMbjAhUJ3o8KHSfkAJEQ6AEIMjAB#v=onepage&q=electromagnetic%20waves%20make%20form%20new%20bonds&f=false
13. Frances Ashcroft, 2000. Life at the Extremes: The Science of Survival, University of California Press, California, p122
14. Robert H. Sanders, 2014. Revealing the Heart of the Galaxy, Cambridge University Press, USA, p70
15. Frank Verheest. Waves in Dusty Space Plasmas, Kluwer Academic Publishers, Netherlands, 89, (2000)
16. Sun Keping, Gefei Yu. Recent developments in Applied Electrostatics (ICAES2004): Proceedings of the Fifth International Conference on Applied Electrostatics, Elsevier Ltd., UK, p87.
17. Pierre L. Fauchais, Joachim V.R. Heberlein, Maher I. Boulos. Thermal Spray Fundamentals From Powder to Part. Springer Science & Business Media, New York, 84 (2014)
18. Manfred Wendish, Jean-Louis Brenguier. Airborne Measurements for environmental Research: Methods and Instruments, Wiley-VCH. Available at: https://books.google.co.uk/books?id=tHdwhn-c5mgC&pg=PT419&dq=A+regularly+oscillating+charge+produces+a+harmonic+electromagnetic+waves+Manfred&hl=en&sa=X&ved=0ahUKEwjBqdv75tvgAhWpSxUIHbQ_D0gQ6AEIKjAA#v=onepage&q=A%20regularly%20oscillating%20charge%20produces%20a%20harmonic%20electromagnetic%20waves%20Manfred&f=false (last accessed on 27.02.2019)
19. Kongbam Chandramani Singh, 2009. Basic Physics, PHL Learning Private Limited, New Delhi, p413
20. Mathura Prasad. Soul, God and Buddha in Language of Science, Notion Press, Chennai(2017)
21. Stephen Pople, 1999. Complete Physics, Oxford University Press, Oxford, p166
22. Roger Barry, Richard Chorley, 1998. Atmosphere, Weather and Climate, 7th edition, Routledge, London, p51
23. Eniday: https://www.eniday.com/en/sparks_en/harnessing-the-energy-of-rain/ (last accessed on 06.02.2019)
24. Krishnakumar, T (2019). Application of Microwave Heating In Food Industry. 10.13140/RG.2.2.27035.72488.
25. Yousif, E., & Haddad, R. (2013). Photodegradation and photostabilization of polymers, especially polystyrene: review. SpringerPlus, 2, 398. https://doi.org/10.1186/2193-1801-2-398
26. Kenneth L., Williamson, Katherine M. Masters, 2011. Macroscale and Microscale Organic Experiments, 6th edition, Brooks/ Cole C engage learning, CA, p720
27. Sivasankar B. Food Processing and preservation, PHI Learning Private Limited, Delhi, 246, (2014)
28. Trevor Day, 1999. Ecosystems: Oceans. Routledge Taylor & Francis Group, London and New York, p44

29. Kenneth W. Raymond, 2010. General Organic and Biological Chemistry, 3rd edition, John Wiley & Sons, Inc., USA, p176
30. Blue planet project: Alien Technical research–25, Westchester Camp, Office of the Central Research #3. CODE: ARAMISIII–ADR3-24SM, p80-81
31. CMOS Emerging Technologies. CMOSET 2012: Abstracts, p49. Available at: https://books.google.co.in/books?id=3XVYC-yBgksC&pg=PA49&dq=mid+infra#v=onepage&q&f=false
32. Jung, D., Bank, S., Lee, M. L., & Wasserman, D. (2017). Next-generation mid-infrared sources. Journal of Optics, 19(12), 123001. doi: 10.1088/2040-8986/aa939b.
33. Sincore, A. & Cook, Justin & Tan, Felix & El Halawany, Ahmed & Riggins, A. & McDaniel, S. & Cook, G. & Martyshkin, Dmitry & Fedorov, V.V. & Mirov, Sergey & Shah, L. & Abouraddy, A. & Richardson, M. & Schepler, Kenneth. (2018). High power single-mode delivery of mid-infrared sources through chalcogenide fiber. Optics Express, 26(6), 7313. doi:10.1364/oe.26.007313.
34. Wu, Bo & Zhao, Zheming & Wang, Xunsi & Tian, Youmei & Mi, Nan & Chen, Peng & Xue, Zugang & Liu, Zijun & Zhang, Peiqing & Shen, Xiang &Nie, Qiuhua & Dai, Shaocong & Wang, R.P. (2018). Mid-infrared supercontinuum generation in a suspended-core tellurium-based chalcogenide fiber. Optical Materials Express, 8(5), 1341. doi: 10.1364/ome.8.001341.

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Development and Validation of a Digital Patient Guide to Clinical Photography for Teleconsultation in Dermatology

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Abstract- *Introduction:* Dermatological teleconsultation requires patients to provide high-quality images of cutaneous lesions for accurate diagnosis and treatment. Patients assume a pivotal role in teledermatology by effectively documenting skin lesions using standardized photographs. This study aimed to develop and validate a digital guide to assist patients in adequately documenting cutaneous lesions for dermatological teleconsultations.

Keywords: *telemedicine. teledermatology. remote consultation. dermatology. digital health. clinical photography. teleconsultation. direct-to-consumer teledermatology. patient digital guide. mobile teledermatology.*

GJMR-K Classification: *NLM Code: WR 500*

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Abstract- ***Introduction:*** Dermatological teleconsultation requires patients to provide high-quality images of cutaneous lesions for accurate diagnosis and treatment. Patients assume a pivotal role in teledermatology by effectively documenting skin lesions using standardized photographs. This study aimed to develop and validate a digital guide to assist patients in adequately documenting cutaneous lesions for dermatological teleconsultations.

Methods: Applied developmental research methods were employed in this study. Bibliographic research was conducted to determine the requirements for high-quality photographic documentation for dermatology. These investigative findings were adapted into a digital guide for patients using simple and accessible language. Subsequently, the digital guide underwent validation by dermatologists and laypeople through questionnaires using a five-point Likert scale and statistical analysis to assess reliability and concordance regarding its content and purpose.

Results: After selecting twenty articles, the digital patient guide was developed. It was based on photographic documentation orientations tailored for primary care physicians due to the lack of materials directed at patients. Reliability analysis revealed Cronbach's alpha coefficients of 0.945 for laypeople and 0.718 for experts. The concordance analysis of dermatologists' questionnaires yielded an intraclass correlation coefficient of 0.79 (95% CI 0.48–0.95). Median Likert scale scores were 4.81 for dermatologists and 5.0 for laypeople.

Conclusions: This study successfully developed a digital patient guide for clinical photography of cutaneous lesions. The validation process, which involved dermatologists and laypeople, confirmed consensus and acceptance of the digital guide, highlighting its potential practical utility.

Keywords: telemedicine. teledermatology. remote consultation. dermatology. digital health. clinical photography. teleconsultation. direct-to-consumer teledermatology. patient digital guide. mobile teledermatology.

I. Introduction

Teleconsultation in dermatology, commonly referred to as direct teledermatology, involves the remote management of patients with dermatological conditions.[1]Dermatology is a medical specialty in which physical examination is visual and is conducted by inspecting the patient's skin.[2] In teledermatology, the most fundamental requirement for accurate diagnosis is the inspection of high-quality images of the patient's skin lesions.[3] Given this scenario, the success of a virtual dermatological examination primarily depends on the patient's active participation, which enables the dermatologist to observe clinical changes indicative of the patient's condition. To ensure the success of teleconsultation, patients must learn how to photograph their skin lesions in a standardized manner.[4] However, a current gap in the academic literature involves the lack of educational resources on clinical photography for teledermatology that are explicitly tailored for patients. Hence, this study aimed to develop and validate a digital guide to assist patients with proper photographic documentation of cutaneous lesions for dermatological teleconsultations.

II. Methods

Applied developmental research methods were employed in this study. The study design was based on several previously published papers related to the development and validation of educational resources in healthcare.[5-7] The Institutional Review Board approved this research.

The development of the digital guide, which commenced with a bibliographic search on the PubMed/MEDLINE and Virtual Health Library/LILACS databases, involved searching for studies that presented guidelines for obtaining clinical photographs of dermatological lesions. The keyword combinations used in the search included "teledermatology," "teleconsultation," "guide," "photography," "photo documentation," "telemedicine," "teleconsultation," "physical examination," "dermatology," and "digital manual." The selection of studies retrieved from the search was based on the following eligibility criteria: 1) articles related to guidance on photographic documentation of cutaneous lesions; 2) articles published between 2019 and 2023; and 3) articles in English, Portuguese, or Spanish.

The primary technical requirements for high-quality photographic documentation of dermatological lesions were derived from the selected articles. Based on these findings, the digital guide for patients was

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developed by adapting the content to a lay audience in a lucid, concise, and intelligible manner. Plain language was given priority, medical jargon was consciously avoided, and sequential steps were established for executing photographic documentation to enhance comprehension of content. Subsequently, illustrations were produced, and the guide's layout was created by applying graphic design techniques.

The digital guide underwent a two-stage validation process in a virtual environment. The objective was to assess both the content and educational purpose of the digital guide. Dermatologists evaluated the guide in the first stage, followed by assessment from laypeople in the second stage.

Online questionnaires, created using the research management application Google Forms (Google LLC, 2023), served as the validation instrument for the study. The questionnaires comprised multiple-choice questions about sociodemographic profiles with a maximum of five options, as well as statements with responses on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The statements in both questionnaires, which were related to the content and purpose of the digital guide, are provided in Table 1 and Table 2.

In the first validation phase, intentional sampling was employed to deliberately select dermatology experts based on their technical attributes and capacity to contribute to the study. Eligibility criteria included board-certified dermatologists with at least three years of practical experience. In the second validation phase, volunteer laypeople were recruited using convenience sampling according to their availability and interest in participating. The eligibility criteria included individuals aged 18 years or older without a professional background in healthcare.

Participants received via email (Gmail, Google LLC, 2023) the link to access the digital guide, an online questionnaire specific to their group, and an informed consent form. These documents were stored and synchronized on the Google Drive cloud server (Google LLC, 2023). All participants in this study provided informed consent.

Statistical analysis of the data obtained from questionnaire responses was conducted using R software (version 4.3.2, R Core Team, 2023) and its "psych" package (version 2.3.6, The Comprehensive R Archive Network, 2023).

The reliability of the questionnaires was assessed by analyzing their internal consistency using Cronbach's alpha, which is considered adequate when between 0.70 and 0.95. Concordance within the expert group was evaluated by the intraclass correlation coefficient (ICC), utilizing a two-way mixed-effects statistical model with absolute concordance. Fleiss' classification was used to interpret the ICC as follows: <0.40, poor; 0.40–0.75, moderate; 0.75–0.90, substantial; and >0.90, excellent.

The distribution of responses for each statement of the questionnaires was assessed. Analyzing the Likert scale scores, the final score was calculated as the mean and median of all questionnaire statements. Unanswered items were excluded from the calculations. Consensus among participants was defined as median values of 4 or higher on the Likert scale, with at least 80% of responses falling into categories 4 and 5. The normality of the data was assessed using Shapiro–Wilk tests. Subsequently, Likert scale scores based on the sociodemographic profiles of the participants were statistically evaluated using Mann–Whitney and Kruskal–Wallis tests.

III. Results

A total of 590 articles with titles and abstracts were initially considered for selection. After applying the eligibility criteria, 50 articles were selected for full-text analysis. Finally, mentions of guidance on dermatological photographic documentation were identified in 20 articles.[2-4,8-24] Most of these articles were intended for general practitioners acquiring patients' images for remote consultations with dermatologists.

Drawing from these papers, we selected the essential technical requirements for capturing appropriate and high-quality photographs of patients' cutaneous lesions for teledermatology. Based on those findings, the digital guide was created. It comprises a front cover, a title page, a table of contents, ten pages, and a back cover. In total, there are 24 distinct illustrations throughout the content pages. The title is "How to Take Photos for Online Consultations in Dermatology," with the subtitle "Digital Patient Guide for Photography of Skin Conditions in Teledermatology" (Figure 1).

During the validation phase of the digital guide, Cronbach's alpha coefficients were 0.945 for the layperson group and 0.718 for the expert group.

Twelve dermatologists were invited to participate in the study, and ten consented to participate in the research. The questionnaire responses were collected in July and August 2023. The majority of dermatologists were female (60.0%) and aged 40–49 years (60.0%), with the next largest group aged 30–39 years (20.0%). Their clinical experience ranged from 11–20 years (30.0%) to 21–30 years (30.0%). Most had completed a medical residency (80.0%), 20.0% held doctorates, and 60.0% were affiliated with academic institutions.

After that, 50 volunteer laypeople were recruited for the study; of these, 17 were excluded based on the eligibility criteria. Thus, the final sample consisted of 33 lay participants who responded to the questionnaire in October 2023. In this group, the majority of participants

were male (54.5%) and aged 20–29 years (42.4%), with the next most extensive group aged 30–39 years (30.3%). Most reported daily internet use (87.9%) and reading of online materials (81.8%).

In evaluating dermatologists' responses to the questionnaire components within Likert scale categories 4 and 5, the results were as follows: 100% of participants found the instructions relevant, perceived the language as accessible to laypeople, and agreed that the guide was suitable for instructing patients participating in dermatology teleconsultations. Additionally, 90% considered the amount of information appropriate. Furthermore, expert participants unanimously concurred that the title and subtitle were coherent, the material addressed critical aspects of photographic documentation of skin lesions, and the guide would effectively clarify patients' doubts during dermatological teleconsultations (Table 1). The ICC for the concordance analysis of the dermatologists' responses was 0.79 (95% CI 0.48–0.95), with an *F*-test statistic of 4.83 ($p < 0.001$).

The distribution of laypeople's responses to the questionnaire components within Likert scale categories 4 and 5 revealed that 81.9% found the manual's appearance suitable, 87.8% considered the page quantity satisfactory, 93.9% asserted that they had no doubt about taking photographs after reading the guide, and 94% agreed that illustrations enhanced text comprehension. Furthermore, 94% of the laypeople deemed the instructions necessary, 90.9% acknowledged the ease of locating information in the manual, 94% asserted that they understood how to take photographs after reviewing the manual, and 93.9% found the guide's text easy to read (Table 2).

In the analysis of Likert scale score responses across all questionnaire statements, laypeople had a mean score of 4.70, a median of 5.0, and a standard deviation of 0.55. The Shapiro–Wilk test had a highly significant result, indicating that the data were not normally distributed ($p<0.001$). Among the dermatologists, the mean score was 4.79, the median was 4.81, and the standard deviation was 0.21. The Shapiro–Wilk test produced a statistically significant result, again indicating that the data were not normally distributed ($p = 0.036$). The different sociodemographic variables examined did not significantly influence the mean scores of either laypeople or expert participants. This suggests a consistent perception of the guide's acceptance across diverse sociodemographic groups.

IV. Discussion

Previous studies have suggested that dermatologists ask their patients to share standardized photographs of cutaneous lesions either before or during teleconsultations. This recommendation is grounded in the understanding that the resolution of available video images during synchronous teleconsultation can be limiting for many patients, thereby hindering the comprehensive evaluation of cutaneous lesions.[15,19] In line with these considerations, the digital guide developed in this study assists patients in autonomously documenting their dermatological lesions using standardized photographs before teleconsultations. This proactive approach is designed to facilitate a more thorough virtual physical examination by dermatologists.

Moreover, earlier studies have offered practical recommendations to physicians and patients participating in teledermatology to enhance their online consultations.[17,19] One article, in particular, provided physicians with guidance on improving the quality of clinical photographs submitted by patients.[17] However, the bibliographic research conducted in this study did not reveal any specific materials designed for direct online access by patients. The digital guide developed in this study aims to address this gap in teledermatology and can be shared online with patients before a teleconsultation.

In the validation stages of the digital guide, Cronbach's alpha suggested that the questionnaires exhibited good internal consistency. The median Likert scale responses indicated high levels of acceptance and understanding of the digital guide among both dermatologists and laypeople. The ICC underscored a substantial level of concordance among dermatologists, which is unlikely to be attributed to random fluctuations. In studies on standardized photographic documentation of cutaneous lesions, training positively influenced family physicians' performance in requesting remote dermatological consultations, enhancing image quality, and improving teledermatology services.[2] The adoption of standardized photographs significantly reduced the need for in-person appointments.[25] Given these benefits, the digital patient guide has the potential to shape outcomes in dermatological teleconsultations, and future studies in practical settings using the digital guide would provide opportunities for exploration and validation.

V. Conclusions

This study reports the successful development of a digital guide tailored for dermatological clinical photography for teleconsultations explicitly designed for patient use. The guide underwent validation by dermatologists and laypeople, both of whom expressed satisfaction with its content and purpose.

The digital patient guide for documenting cutaneous lesions through clinical photography endeavors to assist patients by simplifying the process of generating high-quality clinical images for remote dermatological evaluations.

VI. Digital Guide Availability

The digital patient guide files are openly available in a data repository (Zenodo, European Organization for Nuclear Research and OpenAIRE, 2023).

Portuguese version: https://doi.org/10.5281/zenodo.10883027

English version: https://doi.org/10.5281/zenodo.10892200

References Références Referencias

1. Loh CH, Chong Tam SY, Oh CC. Teledermatology in the COVID-19 pandemic: A systematic review. JAAD Int. 2021;5:54-64.
2. Massone C, Javor S, Amato I, Biondo G, Brunasso AMG, Hofmann-Wellenhof R. Training of primary care physicians enhances performance of mobile teledermatology. An Bras Dermatol. 2021;96:514-6.
3. Pasquali P, Sonthalia S, Moreno-Ramirez D, Sharma P; Agrawal M; Gupta S, et al. Teledermatology and its current perspective. Indian Dermatol Online J. 2020;11:12-20.
4. Haque W, Chandy R, Ahmadzada M, Rao B. Teledermatology after covid-19: Key challenges ahead. Dermatol Online J. 2021; 27: 13030/qt5xr 0n44p.
5. Peixoto NM, Peixoto TA, Pinto CA, Santos CS. Validation of an educational intervention to promote health behaviors in cancer survivors: e-Delphi technique. Referência. 2022;6:e21051.
6. Azevedo LFS, Pontes-Silva A, Mendes RG, Silva CDD, Shimoya-Bittencourt W, Baggio JAO, et al. Measurement properties of the Brazilian version of the Kidney Symptom Questionnaire. Rev Assoc Med Bras (1992). 2023; 69: e20221546.
7. Pontes PA, Cruz FOAM, Reis PED. Validation of a guidance manual for patients undergoing brachytherapy for gynecologic cancer. Cogitare Enferm. 2020;25:e67109.
8. Petersilge CA. Fundamentals of Enterprise Photodocumentation: Connecting the clinical and technical – a review of key concepts. J Digit Imaging. 2019; 32:1052-61.
9. Von Wangenheim A, Nunes DH. Creating a web infrastructure for the support of clinical protocols and clinical management: An example in teledermatology. Telemed J E Health. 2019;25:781-90.
10. Abbott LM, Soyer HP. A CLOSE-UP guide to capturing clinical images. Australas J Dermatol. 2020; 61: 353-4.
11. Abbott LM, Miller R, Janda M, Bennett H, Taylor M, Arnold C, et al. Practice guidelines for teledermatology in Australia. Australas J Dermatol 2020; 61:e293-e302.
12. Muraco L. Improved medical photography: Key tips for creating images of lasting value. JAMA Dermatol. 2020;156:121-3.
13. Su MY, Trefrey BL, Smith GP, Das S. Online portal-based system for improving patient-generated photographs for teledermatology. Dermatol Ther. 2020;33:e14453.
14. Tower JI, Lee JY and Lee YH. Screenshot photography: Optimizing photo-documentation while using telehealth video platforms. Facial Plast Surg Aesthet Med. 2020;22:240-2.
15. Choi E, Mak WK, Law JY, Santos D, Quek SC. Optimizing teledermatology: Looking beyond the COVID-19 pandemic. Int J Dermatol. 2021;60:119-21.
16. Low ZM, Scardamaglia L, Morgan V, Kern JS. Australian teledermatology experience during COVID-19. Australas J Dermatol. 2021;62:e596-e600.
17. Manuelyan K, Shahid M, Vassilev V, Drenovska K, Vassileva S. Direct patient-to-physician teledermatology: Not a flash in the pan(demic). Clin Dermatol. 2021;39:45-51.
18. Sendagorta E, Servera G, Nuño A, Gil R, Pérez-España L, Herranz P. Direct-to-patient teledermatology during COVID-19 lockdown in a health district in Madrid, Spain: The EVIDE-19 pilot study. Actas Dermosifiliogr (Engl Ed). 2021;112:345-53.
19. Patel J, Mal R, Patel R, Mostow E. Improving quality of teledermatology visits: The Skin-Know-Implement-Next checklist. J Am Acad Dermatol. 2022;86:1450-1.
20. Jiang SW, Flynn MS, Kwock JT, Nicholas MW. Store-and-forward images in teledermatology: Narrative literature review. JMIR dermatol. 2022;5:e37517.
21. Baig IT, Nguyen QD, Jahan-Tigh RR, Migden MR. Digital photography for the dermatologist. Clin Dermatol. 2023;41:171-7.
22. Lui BLJ, Yeo DST, Chandran NS. Diagnostic accuracy and photographic quality of in-patient teledermatology during the COVID-19 pandemic in Singapore. JAAD Int. 2023;12:46-8.
23. Tuknayat A, Bhalla M, Dogar K, Thami GP, Sandhu JK. Clinical profile and diagnostic accuracy of patient-submitted photographs in teledermatology. J Clin Aesthet Dermatol. 2023;16:21-5.
24. Gomez J, Mazzoleni M, Calugar A, Pol-Rodriguez M, Ko JM, Bailey EE. Optimizing virtual visits and reducing inbox messages using a pre-visit questionnaire: A quality improvement project. J Am Acad Dermatol. 2023;88:1363-4.
25. Helen JL, Cumsky BS, Connor J, Maly BS, Collin M, et al. Costello MD, et al. Impact of standardized templates and skin cancer learning modules for teledermatology consultations. Int J Dermatol. 2019; 58: 1423-9.

Summary

Recommendations for each region of the body

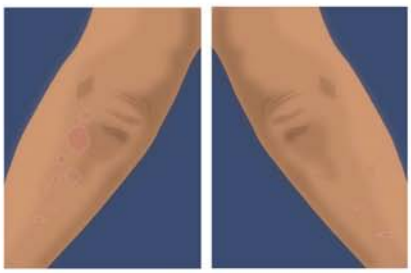
Scalp and hair

If the problem is with your scalp or hair, photograph any areas where you notice hair loss or changes in the scalp skin.

To help keep the photos in focus, dampen and secure strands of hair with a clip around the area you will photograph. This is crucial to prevent the camera from focusing on a stray hair instead of your skin.

Arms and legs

Take pictures of both arms or legs for comparison, even if the problem is only on one side.



Recognizing good-quality photos

Photographs will be of good quality for teleconsultation if:

1. They are well-focused—that is, not blurry or "shaky."
2. Skin, hair, or nail problems are centered in the photo viewing field.
3. They do not have shadows or glare.
4. They have good lighting.
5. They represent all areas of the body with the problem in question.

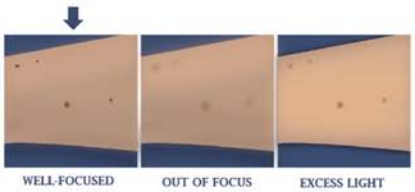


Figure 1: Example of the Digital Patient Guide: Table of Contents and Some of Illustrated Pages

Table 1: Distribution of Responses to the Likert Scale Questionnaire about the Digital Guide that was Administered to Participating Dermatologists

Statement	1	2	3	4	5
The orientation contained in the guide is relevant.	0	0	0	2 (20%)	8 (80%)
The language of the guide is accessible to laypeople.	0	0	0	3 (30%)	7 (70%)
The amount of information contained in the guide is adequate.	0	0	1 (10%)	5 (50%)	4 (40%)
The main title and subtitle are consistent with the purpose of the guide.	0	0	0	0	10 (100%)
The illustrations in the guide are appropriate for the corresponding text.	0	0	0	1 (10%)	9 (90%)
The guide addresses the main aspects related to photographic documentation of skin lesions by the target audience.	0	0	0	0	10 (100%)
The guide's content will help clarify patients' doubts regarding photographic documentation of skin lesions for dermatological teleconsultation.	0	0	0	0	9 (100%)
The guide is suitable for a patient participating in a dermatological teleconsultation.	0	0	0	4 (40%)	6 (60%)

Note: 1: Strongly disagree; 2: Partially disagree; 3: Neutral; 4: Partially agree; 5: Strongly agree.

Table 2: Distribution of Responses to the Likert Scale Questionnaire about the Digital Guide that was Administered to Participating Laypeople

Statement	1	2	3	4	5
The appearance of the guide is adequate.	0	0	6 (18.2%)	5 (15.2%)	22 (66.7%)
The number of pages is satisfactory.	0	1 (3%)	3 (9.1%)	8 (24.2%)	21 (63.6%)
After reading the guide, there were no doubts about how to take photographs for the online consultation.	0	1 (3%)	1 (3%)	1 (3%)	30 (90.9%)
The illustrations in the guide help the reader understand the text.	0	1 (3%)	1 (3%)	2 (6.1%)	29 (87.9%)
The orientation contained in the guide is important.	0	0	2 (6.1%)	5 (15.2%)	26 (78.8%)
It is easy to find information in the guide.	0	0	3 (9.1%)	4 (12.1%)	26 (78.8%)
After reading the guide, it was possible to understand how to take photographs for the online consultation.	0	0	2 (6.1%)	2 (6.1%)	29 (87.9%)
The guide text is easy to read.	0	0	2 (6.1%)	3 (9.1%)	28 (84.8%)

Note: 1: Strongly disagree; 2: Partially disagree; 3: Neutral; 4: Partially agree; 5: Strongly agree.

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Beyond Anatomy: I Don't Have a Uterus, What Now? Case Report and Literature Review

By Maria Clara Machado Briefs, Sheila R. Niskier, Christiane de Morais Junqueira Camargo, Márcia Nunes Gaspar, Bárbara Soares da Silva & Maria Sylvia de Sousa Vitalle

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Summary- *Rokitansky*-Küster-Hauser syndrome (MRKH) is characterized by agenesis or aplasia of the uterus and upper part of the vagina and is considered the second most common cause of primary amenorrhea. The psychological repercussions are significant and are directly related to sexual and reproductive health. This work reports the case of a teenager with MRKH and reviews the syndrome and the main factors that impact mental health.

Case Description: Adolescent 14 years old, female, absence of menarche, sexual life not initiated, Tanner M5P5. Pelvic ultrasound with hypoplastic uterus, magnetic resonance imaging of the pelvis with non-individualized uterus, unidentified vagina and ovaries with normal topography and morphology.

Keywords: *adolescent; amenorrhea; teenager behavior; infertility female.*

GJMR-K Classification: *NLM Code: WQ 220*

Strictly as per the compliance and regulations of:

Beyond Anatomy: I Don't Have a Uterus, What Now? Case Report and Literature Review

Maria Clara Machado Briefs [α], Sheila R. Niskier [σ], Christiane de Morais Junqueira Camargo [ρ], Márcia Nunes Gaspar [Ω], Bárbara Soares da Silva [¥] & Maria Sylvia de Sousa Vitalle [§]

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Case Description: Adolescent 14 years old, female, absence of menarche, sexual life not initiated, Tanner M5P5. Pelvic ultrasound with hypoplastic uterus, magnetic resonance imaging of the pelvis with non-individualized uterus, unidentified vagina and ovaries with normal topography and morphology. Diagnosed with MRKH and has no desire to perform vaginal dilation. He has difficulty talking about the syndrome and aspects of his sexual life. She appeared sad and felt inadequate, especially after her father told her she was "less of a woman."

Discussion: MRKH is the second most common cause of primary amenorrhea and its psychosocial impact is relevant. Historically, the uterus is described as primordial in female identity and menarche is an important milestone in puberty in girls. People with the syndrome tend to present more anxious and depressive symptoms, image disturbances, influencing self-esteem and identity construction.

Conclusion: The diagnosis of MRKH involves several factors that go beyond anatomical changes. Therefore, it is essential to include emotional aspects in the clinical approach, aiming to improve sexual, reproductive and mental health and, above all, the quality of life of these people.

Keywords: adolescent; amenorrhea; teenager behavior; infertility female.

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I. Introduction

Rokitansky - Küster-Hauser syndrome (MRKH) is a congenital syndrome characterized by malformation of the Müllerian system , resulting in agenesis or aplasia of the uterus and upper part of the vagina. The ovaries are functional and the development of secondary sexual characteristics occurs physiologically, so hormonal levels are generally normal. [(1)] The main symptom is primary amenorrhea and the diagnosis is normally made in adolescence, a period of complex physical and psychological transformations. [(2)] Therefore, the psychosocial repercussion is quite relevant and involves delicate aspects in a woman's life such as self-affirmation, sexual and reproductive health, impacting the formation of identity and interpersonal relationships. [(3)] Despite the well-established influence on mental health, especially among adolescents, much of the medical care is focused on physical changes and little directed towards emotional and psychological support. [(2)] Thus, this work describes the case of a teenager with MRKH, covering the etiopathogenesis , diagnosis and therapy, as well as the psychological aspects that involve the absence of the uterus and, consequently, menstruation for people with the syndrome. The work was approved by the Research Ethics Council number 3524696.

II. Case Report

A 14-year-old female adolescent, with no pathological history, reported the absence of menarche despite the complete development of secondary characteristics. The mother reported thelarche between the ages of eight and nine, pubarche at nine and growth spurt at eleven. The patient denies beginning sexual life. The physical evaluation presents Tanner staging M5P5 , external morphology of the genitalia without abnormalities, annular hymen and indirect vaginometry less than 2cm. Hormonal tests within the references for age and sex. Pelvic ultrasound (USG) with hypoplastic uterus of 1cm^3 and ovaries of compatible size for age. Magnetic Resonance Imaging (MRI) of the pelvis showed a non-individualized uterus, unidentified vagina, ovaries with normal topography and morphology. Karyotype 46,XX . To screen for extra-genital

malformations , USG of the kidneys and urinary tract, echocardiogram transthoracic and cervical - thoraco - lumbar spine radiography without abnormalities.

In view of the clinical characteristics, combined with laboratory and imaging tests, the diagnosis of MRKH syndrome type 1 was made. The teenager had difficulty discussing the syndrome and its repercussions, so the mother took the lead in the consultation. She appeared sad and felt inadequate, especially after her father said that she was "less of a woman" due to her anatomical changes. There is no desire to perform vaginal dilation or any therapeutic intervention. Psychological support was offered, but she was unreceptive and preferred not to talk about topics involving her emotions and sexuality.

III. Discussion

Congenital uterine anomalies manifest themselves in different ways, both in the development and shape of the uterus, commonly involving adjacent organs such as the cervix and vagina. Among these malformations, Müllerian agenesis (or MRKH) stands out. Next, the biological aspects of the syndrome, etiopathogenesis , clinical manifestations, diagnosis and therapeutic options will be presented. Subsequently, the psychological impact will be addressed, including the meaning of the absence of a uterus for these women, as well as the consequences on menstruation and fertility, important factors in the construction of identity and interpersonal relationships.

a) Epidemiology and Etiopathogenesis

MRKH syndrome, also known as Müllerian agenesis , is a rare disease, with an estimated prevalence of 1 in 5,000 [4] and occurs due to embryological changes in the differentiation and migration of the mesoderm, the tissue responsible for the formation of the reproductive, urinary, and skeletal and cardiac (systems most affected by the syndrome).[5] The etiology remains uncertain, possibly multifactorial, with genetic, chemical, mechanical and environmental components. Some chromosomal regions described and possible genes involved are 1q21.1 (RBM8A gene), 1p31-1p35 (WNT4 gene), 7p15.3 (HOXA gene), 16p11 (TBX6 gene), 17q12 (LHX1 and HNF1B genes), 22q11.21 and Xp 22. [6] Despite the increasing advancement of genetic research, there are still barriers to this investigation given the low availability of tests and their high cost, factors that prevented such an investigation in the case described.

b) Classification

The syndrome is classified as type 1 when only the reproductive system is affected and type 2 is accompanied by other extragenital malformations, generally renal, skeletal, cardiac, ocular, auditory and inguinal hernias. [1,8] The case described was classified as type 1 and no extragenital malformation was detected.

c) Clinical Presentation and Diagnosis

The karyotype is 46,XX and there are no abnormalities in hormonal levels or development in childhood. The syndrome is considered the second most common cause of primary amenorrhea and the diagnosis usually occurs in adolescence, during investigation of the absence of menarche. Other common symptoms are dyspareunia and cyclical abdominal pain. [3] On physical examination, the physiological development of secondary sexual characteristics is observed and the vagina is typically blind, generally measuring 0 to 3 cm. [1] In the case reported, the teenager had completed pubertal development for more than 2 years, without menarche and with a short vagina.transabdominal or transperineal USG shows absence of the upper part of the vagina and uterus. [10] MRI provides more image details, with the typical finding being uterine agenesis, although it is possible to find remaining Müllerian ducts. [10] The case presented showed a non-individualized uterus and topical ovaries, better visualized on MRI.

d) Therapeutic Options

Since 2002, the American College of Gynecology and Obstetrics has recommended the use of vaginal dilators as the first line of treatment, however the technique's success rates depend directly on the patient's disposition and motivation. Surgical treatment with vaginoplasty is reserved for patients who have not responded to conservative treatment. [1.11]

Although most adolescents do not have a reproductive desire, it is important to provide guidance and clarification on current techniques and monitoring with a specialized team is recommended. As the ovary is functional, "*in vitro*" fertilization and a surrogate uterus, popularly known as "surrogacy", can be performed, although the practice is prohibited in several countries. [1]In Brazil, according to the resolution of the Federal Council of Medicine (CFM) number 2294/21, the temporary transfer of the uterus can be carried out as long as the surrogate mother belongs to the family of one of the partners in a blood relationship up to the fourth degree and has at least one living child. [12]

Another promising option for treating infertility is uterine transplantation. There are already reports of successful cases, but it is still an experimental procedure. [1]

e) Psychosocial Impact

The psychological repercussions of the syndrome are relevant and directly impact intimate aspects of women, such as sexual activity and fertility. Furthermore, most diagnoses are made during adolescence, a period of great physical, psychological, social and affective transformations.

A 2021 systematic review, focusing on the psychological impact, showed that the majority of patients had negative emotions upon diagnosis, including suicidal thoughts. They also had a higher incidence of anxious and depressive symptoms, low self-esteem and image disorders, as well as feelings of fear, guilt, denial and inadequacy. [2,13,14] It is estimated that two thirds of patients experience anxiety and, in approximately one quarter of cases, the manifestations are moderate to severe. [15]

Most affected women report feeling "incomplete", "different", "sexually inadequate" or "defective ". [16,17] These feelings show the power of the uterus and menstruation as symbols of the social role of women and how, today, they still influence society, although there may be variations according to the historical moment, religion and culture. [18]

I didn't menstruate . Is there something wrong with me? – Meaning of menarche throughout history

Menarche is considered an important milestone in a woman's life and has received different connotations throughout history and different cultures. It is probably the most important physical change in girls' puberty and involves not only biological transformation, but all the emotional and social adjustment linked to it. Etymologically, it originates from the Greek – "*men"* referring to "moon" and "month" and – "*arkhe"* meaning beginning, representing a rite of initiation into female adult life [19] , also described as the first "mystery feminine". [20]

In the era of matriarchy, birth, menstruation, sexuality, menopause and death were considered the milestones of a woman's life. Menstrual blood was linked to the sacred and was used in mystical rituals, to fertilize the earth and as a representation of feminine strength, associated with the idea of life, death and cycles of nature. More contemporary theories, such as the one proposed by Langer [21] , reinforced the idea of menstrual bleeding as an indicator of female normality, acceptance of one's own sex and sexuality, maintaining a relationship with fertility, capacity for regeneration, strength and power. [19]

However, from the 19th century onwards, the association of menstruation with negative ideas grew, largely influenced by the spread and domination of patriarchy in current cultures. As a result, ideas of fear of blood and female inferiority were disseminated because they were unable to "control their bodies" by bleeding every month, in addition to emphasizing the harm involved in the menstrual period and before it. [19]

Over time, the symbology and rites linked to menarche lost importance and women were taught to deal with the menstrual period as a physiological and mechanical event. Regardless of the positive or negative connotation in relation to the menstruation process, it is known that it currently maintains great psycho-emotional and socio-cultural significance, influenced by several factors, such as the way of preparing for the period, expectations, age, emotional support and personality traits. [19,22]

Given this, the inability to menstruate also gains considerable significance for women at an individual and social level, especially in adolescence, triggering ambivalent feelings regarding this process. [19]

An English qualitative study brings reports from patients aged 18-22 years diagnosed with MRKH and assesses the social and emotional impact. One of the participants draws attention to the fact that she feels different and is unable to participate in dialogues with her peers on simple subjects, such as menstruation. Furthermore, the absence of menstruation was shown to be related to the loss of part of the identity with the female gender, portrayed in the speech of one of the girls that part of her feminine side "was gone" when she learned that she would never have a menstrual period "like all women". woman ". [14]

The fact that they feel "different" makes many choose not to share their diagnosis with other people and even lie about their menstruation during medical appointments because they feel embarrassed and afraid of being judged. [17] In addition to self-judgment, many of these people also suffer from social pressure from their environment, including friends, family and partnerships. [18] In the case described, in addition to the difficulty in organizing her own feelings regarding the repercussions of the syndrome, the patient appeared extremely fragile after her father's comment that she would be "less of a woman" due to her anatomical changes.

f) Uterus and Reproductive Function

The relationship between the uterus and femininity dates back to antiquity and has also received different analytical, religious and cultural connotations over the centuries. [19] According to Colling [23], Plato introduced the idea of the uterus as a "matrix", which would correspond to a "rabid animal" that would live inside women with the desire to procreate. This theory was incorporated by several thinkers, assigning the organ a fundamental role in women's identity, as their main function would be procreation. Psychoanalysis was also influenced by this thought, as portrayed in one of Freud's theories in 1923 [24], in which motherhood would be the "normal destiny of femininity".

These ideas of biological determinism, which emphasize women's reproductive function as a fundamental role, began to be questioned at the end of the 19th century with feminist demonstrations, when women began to occupy spaces outside the domestic nucleus and claim sexual freedom. From this, associated with the development of contraceptive methods, women began to have the power to decide regarding pregnancy and the restructuring of family

configurations began with women expanding their roles in society. [25,26] Furthermore, together with feminist movements, discussions are beginning to emerge about gender and the meaning of the feminine beyond biological aspects, as Simone de Beauvoir brings in her theories on the social construction of women, emphasizing the fact of "becoming herself as a woman", the central subject of his work "The second sex" published in 1949. [27]

Since then, women have been gaining more space in the job market and expanding their roles in society. Thus, there are those who dream of motherhood while others do not express this desire or postpone pregnancy due to various factors. Despite this, the symbolism of the uterus in femininity continues to be very relevant and the absence of this organ associated with the impossibility of gestation has an important impact on women in the most diverse cultures, gaining even greater relevance in more conservative societies. [25]

A review study on the psychological impact shows that the inability to conceive is one of the main stressors in the syndrome, having greater influence as age increases, while in adolescence ambivalent perceptions are observed. [16]

A 22-year-old participant in an English qualitative study, when she learned that she could not carry a pregnancy, reported feeling childish and not being "completely feminine". In the statement she says that one of the basic points of being a woman is being able to produce children and increase the population. So, the fact that she doesn't achieve this makes her feel like less of a woman. She also reports that she began to force herself to "be more feminine" by wearing more makeup and skirts to ensure that people knew she was a woman. Another patient in the same study, also 22 years old, reports that the absence of a uterus does not affect her because until now she has not needed this organ. A third patient, aged 18, reported not being as affected as she prefers to focus on other areas of her life and avoids thinking about her diagnosis. [14]

g) Repercussions on Interpersonal Relationships

The feeling of being "different" and "sexually inadequate" leads many patients to a place of isolation, accompanied by insecurity about themselves and questioning their own identity. [18] It is important to highlight that they often compare themselves negatively with other women, feeling "inferior". [28]

Several participants reported feeling less confident after the diagnosis and less worthy of intimate relationships, as their partner would be at a "disadvantage" with them in relation to other women. [14] Still others feel "less attractive" and accept violent or abusive relationships because they believe they are not worthy because they cannot conceive. [28]

To deal with such situations, some prefer not to get involved in intimate relationships because they feel embarrassed [14] or because of the constant fear of rejection. [17]

In countries like Malaysia, where a more conservative culture prevails, patients reported that they did not have any access to information about sexual intimacy from the medical team because it was considered "taboo" to talk about sexuality or that it should only be mentioned after marriage. As a result of this misinformation, many of them had traumatic experiences during sexual intercourse that could have been prevented if there was greater dialogue and guidance on these issues. [17]

Furthermore, a 2022 review analyzed 14 articles that evaluated the impact of the syndrome on sexual function, indicating a relationship with greater difficulty in maintaining lubrication, experiencing orgasm, in addition to experiencing pain during sexual intercourse. Furthermore, one of the studies highlighted that girls with MRKH tend to start relationships later and have lower sexual frequency. [29]

As the syndrome impacts women's intimate aspects, many teenagers and even adults find it difficult to speak openly about the topic in the face of prejudice, in addition to religious and social issues. Furthermore, a large part of medical care is focused on physical and objective aspects of the syndrome and patients complain that they have not been able to adequately understand the complexity of the syndrome's implications for sexual and reproductive life. [2,18]

In adolescent care, mothers or guardians often assume the central role in the approach and the patient herself does not actively participate in decisions. [2] This fact was mentioned by the teenager in a study when she complained that her autonomy was not recognized and that decisions were mediated between the health professional and her mother. [14] In the above case, the mother also assumed a central role in therapeutic decisions, while the teenager had difficulty talking about the syndrome and its repercussions, perhaps due to cognitive and emotional immaturity inherent to her age, not having assimilated the information adequately or preferring focus on other aspects of your life.

h) An Adolescence Perspective

Adolescence, according to the World Health Organization [30] , covers the period from 10 to 19 years and involves major biopsychosocial transformations. The set of signs and symptoms typical of this phase are called by some authors as "normal adolescence syndrome" and the individual goes through the loss of the child's body and the child's social roles to enter the search for themselves and adult identity. [31]

The construction of identity is determined by several factors, including family, cultural and social. The direct influence of the syndrome on sexual and

reproductive life can lead to questioning one's identity and confusion regarding one's body, gender, social and sexual roles. [28] This variability in emotions was described by a study participant when she said that she felt sad one day, happy the next day, then depressed again and that this diagnosis took a lot away from her. [14]

In a didactic way, adolescence can be classified as early, middle and mature, based more on psychic and behavioral characteristics than chronological ones, although age also, admittedly, has its value, especially in defining periods. In the initial period, around 10 to 14 years old, biological changes and emotional fluctuations begin, attention turns to oneself, and self-reference is common. They begin to question their parents and authority figures, reducing interest in the family cycle and increasing the desire for independence. [32.33]

Most diagnoses occur in middle adolescence, between 14 and 17 years old, with greater influence from social groups, tendency to experiment, test limits, improve abstract thinking skills, reasoning and creativity. [33,34] When they discover the syndrome at this stage, the feeling of "not belonging" has a strong influence on self-esteem and identity construction, after all, not menstruating at the right time like other girls makes them feel more different at the moment. who seek precisely to resemble their peers. [28]

Age-related immaturity can manifest itself in difficulty in processing and dealing with so much new information in a short space of time and great variability in emotional responses. [28] One of the participants in a qualitative study mentioned that she was unable to understand the diagnosis and its implications, given the many physical and psychological changes she was already experiencing . He adds that, some time later, he began to have a different view and that if he had been more mature, he would have asked different questions and requested other information at the time of the diagnosis. [18]

Late or mature adolescence, commonly occurs from the age of 17-18, when there is progress in the consolidation of identity, the ability to rationalize for making decisions independently, establishing limits, planning and beginning to assume roles and responsibilities typical of adults. [32,33] With the development of hypothetical-deductive thinking, they begin to worry about long-term projects and women affected by MRKH may be more bothered by their inability to become pregnant. Furthermore, with emotional and cognitive maturity, sexual intercourse becomes more frequent and it is possible that they begin to show greater interest (or aversion) to gynecological interventions such as the use of vaginal dilators and the sexual act itself. [28]

The Medical Consultation. How to improve the approach?

Although the psychological repercussions of MRKH syndrome are well established, most services do not have the structure to provide adequate care for these patients, especially mental health ones. The moment of diagnosis is often marked by pain and confusion, with some authors even establishing a relationship with symptoms of post- traumatic stress. [28,35,36] socio-emotional aspects in the consultation when explaining anatomical anomalies and their repercussions, going beyond the objective and biological point of view. Furthermore, the importance of ensuring that the patient assumes her autonomy and is the protagonist of care is highlighted, especially during adolescence. [2] The consultation during this period of life takes on some particularities, such as moments together with the family member and with the adolescent alone, in order to ensure privacy, confidentiality and medical secrecy. [34] Individualization of care is a key factor in the approach and the professional must seek to understand how the individual feels and what resources they use to deal with the situation, as these are intimate matters that the person being assisted may not want to share with others, even if they are family or close people. [18.28]

Furthermore, a multidisciplinary approach is necessary, including individual psychology and/or support groups and mutual strengthening among these women, so that they feel more belonging and the long-awaited improvement in self-esteem and mental health in general occurs. [3.14]

IV. Conclusion

MRKH syndrome is the second cause of primary amenorrhea and directly impacts women's health, specifically their sexuality and reproductive health. Most diagnoses occur during adolescence, a period already marked by major biopsychosocial transformations in addition to emotional and cognitive immaturity, demanding greater attention to these factors. Therefore, it is essential that the clinical approach contemplates not only the physical aspects related to the malformation of the reproductive tract, but also encompasses emotional factors, individualizing care and making the adolescent occupy a protagonist role in her process. The establishment of a bond that allows dialogue and clarification about sexual health is an exceptional element in consultations, in addition to adequate guidance regarding therapeutic options and reproductive future, aiming to improve quality of life and mental health.

References Références Referencias

1. (MRKH) syndrome: a comprehensive update. Orphanet J Rare Dis. 2020 Aug; 15(1): 214. doi:10.1186 /s13023-020-01491-9.
2. Wagner A, Brucker SY, Ueding E, Grober -Gratz D, Simoes E, Rall K, et al. Treatment management during the adolescent transition period of girls and young women with Mayer- Rokitansky - Küster-Hauser syndrome (MRKHS): a systematic literature review . Orphanet J Rare Dis. 2016 Nov;11(1):152. doi:10.1186 /s13023-016-0536-6.
3. Liszewska-Kapłon M, Strózik M, Kotarski Ł, Bagłaj M, Hirnle L. Mayer- Rokitansky - Küster-Hauser syndrome as an interdisciplinary problem. Adv Clin Exp Med. 2020 Apr; 29(4): 505-511. doi:10.17219 / acem /118850.
4. Herlin M, Bjørn AM, Rasmussen M, Trolle B, Petersen MB. Prevalence and patient characteristics of Mayer- Rokitansky - Küster-Hauser syndrome: a nationwide registry- based study. Hum Reprod. 2016 Oct; 31(10): 2384-90. doi:10.1093 / humrep /dew220.
5. Kyei-Barffour I, Margetts M, Vash-Margita A, Pelosi E. The embryological landscape of Mayer-Rokitansky - Küster-Hauser syndrome: genetics and environmental factors. Yale J Biol Med. 2021 Dec; 94(4):657-672. PMID: 34970104.
6. Triantafyllidi VE, Mavrogianni D, Kalampalikis A, Litos M, Roidi S, Michala L. Identification of genetic causes in Mayer- Rokitansky - Küster-Hauser (MRKH) syndrome: a systematic review of the literature. Children. 2022 June; 9(7): 961. doi:10.3390 /children9070961.
7. Duru UA, Laufer MR. Discordance in Mayer-von Rokitansky-Küster-Hauser syndrome noted in monozygotic twins. J Pediatr Teenager Gynecol. 2009 Aug; 22(4): e 73-5. doi:10.1016/j.jpag.2008.07.012 .
8. Rall K, Eisenbeis S, Henninger V, Henes M, Wallwiener D, Bonin M, et al. Typical and atypical associated findings in a group of 346 patients with Mayer- Rokitansky - Küester-Hauser syndrome. J Pediatr Teenager Gynecol. 2015 Oct; 28(5): 362-8. doi:10.1016/j.jpag.2014.07.019 .
9. Practice Committee of American Society for Reproductive Medicine. Current evaluation of amenorrhea. Fertile Sterile. 2008 Nov; 90 (5 Suppl): S 219-25. doi:10.1016/j.fertnstert.2008.08.038 .
10. Rousset P, Raudrant D, Peyron N, Buy JN, Valette PJ, Hoeffel C. Ultrasonography and MRI features of the Mayer- Rokitansky - Küster-Hauser syndrome. Clin Radiol. 2013 Sept; 68(9): 945-52. doi:10.1016/j.crad.2013.04.005.
11. Committee on Adolescent Health Care. ACOG Committee Opinion No. 728: Müllerian agenesis: diagnosis, management, and treatment. Obstet Gynecol. 2018 Jan; 131(1): e 35-e42. doi:10.1097/AOG.0000000000002458.
12. CFM. CFM Resolution No. 2,294/2021. DOU 06/15/2021. Available at: https://sistemas.cfm.org.br/normas/arquivos/resolucoes/BR/2021/2294_2021.pdf . Accessed on: 12 Feb. 2024.
13. Chen N, Song S, Duan Y, Kang J, Deng S, Pan H et al. Study on depressive symptoms in patients with Mayer- Rokitansky - Küster-Hauser syndrome : an analysis of 141 cases. Orphanet J Rare Dis. 2020 May;15(1):121. doi:10.1186 /s13023-020-01405-9.
14. Patterson CJ, Crawford R, Jahoda A. Exploring the psychological impact of Mayer- Rokitansky - Küster-Hauser syndrome on young women: an interpretative phenomenological analysis . J Health Psychol. 2016 July; 21(7): 1228-40. doi: 10.1177 /1359105314551077.
15. Song S, Chen N, Duan YP, Kang J, Deng S, Pan HX, et al. Anxiety symptoms in patients with Mayer- Rokitansky - Küster-Hauser syndrome: a cross-sectional study. Chin Med J. 2020 Feb; 133(4): 388-94. doi:10.1097/CM9.0000000000000648.
16. Facchin F, Francini F, Ravani S, Restelli E, Gramegna MG, Vercellini P, et al. Psychological impact and health-related quality-of-life outcomes of Mayer- Rokitansky - Küster-Hauser syndrome: a systematic review and narrative synthesis . J Health Psychol. 2021 Jan; 26(1): 26-39. doi:10.1177 /1359105319901308.
17. Hatim H, Zainuddin AA, Anizah A, Kalok A, Daud TI, Ismail A, et al. The missing uterus, the missed diagnosis, and the missing care. Mayer-Rokitansky - Küster-Hauser syndrome in the lives of women in Malaysia. J Pediatr Teenager Gynecol. 2021 Apr; 34(2): 161-7. doi:10.1016/j.jpag.2020.11.009.
18. Holt R, Slade P. Living with an incomplete vagina and womb: an interpretative phenomenological analysis of the experience of vaginal agenesis. Psychol Health Med. 2003 Feb; 8(1): 19-33. doi:10.1080 /1354850021000059232.
19. Saito, MI. Adolescence: prevention and risk/Editors Maria Ignez Saito, Luiz Eduardo Vargas da Silva and Marta Miranda Leal. 3rd Ed. São Paulo: Editora Atheneu, 2014. p 127-36.
20. Zweig, C. Woman: in search of lost femininity. São Paulo: Gente, 1994. p. 253-67.
21. Langer, M. Motherhood and sex. 2. Ed. Porto Alegre: Artes Médicas, 1986. p. 24-31.
22. Ussher JM, Perz J, Chrisler JC. Routledge international handbook of women's sexual and reproductive health. Chapter 2. Menarche. UK: Taylor & Francis. 2020. p. 28-35. Available at: https://www.google.com.br/books/edition/Routledge_International_Handbook_of_Wome/L0uxDwAA

QBAJ?hl=pt-PT&gbpv=0 . Accessed on: 19 Feb. 2024.
23. Colling AM. The historical construction of the female body. Women's Space Notebook. DENY [internet]. 2016 Apr; 28(2). Available at: https //seer.ufu.br/index.php/neguem/article/view/34170. Accessed on: 24 Feb. 2024.
24. Freud S. Infantile genital organization (1923). In: Freud S, Moraes MR. Love, sexuality, femininity. Belo Horizonte: Autêntica, 2019. p. 237-245.
25. Kehl MR. Displacements of the feminine: the Freudian woman in the transition to modernity. São Paulo: Boitempo Editorial, 2016. 232p.
26. Verceze FA, Cordeiro SN. Not all femininity: a systematic literature review.Psychonal Time. [internet] 2019 Dec;51(2):140-65. Available at <http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S0101-48382019000200008 & lng=pt&nrm=iso>. Accessed on: 19 Feb. 2024.
27. Beauvoir S [1949] The second sex. 1. Facts and Myths. São Paulo: European Book Diffusion, 4th edition (Original edition: Le deuxième sex. Paris: Gallimard).
28. Heller- Boersma JG, Edmonds DK, Schmidt UH, 2009. A cognitive behavioral model and therapy for utero - vaginal agenesis (Mayer- Rokitansky - Küster-Hausser syndrome: MRKH). Behav Cogn Psychother. 2009 July; 37(4)449-67. doi:10.1017/S1352465809990051.
29. Tsarna E, Eleftheriades A, Eleftheriades M, Kalampokas E, Liakopoulou MK, Christopoulos P. The impact of Mayer- Rokitansky - Küster-Hauser syndrome on psychology, quality of life, and sexual life of patients: a systematic review. Children. 2022 Apr; 9(4):484. doi:10.3390/children9040484.
30. WHO. mental health of adolescents . [1975]. Available at: https://www.who.int/health-topics/adolescent-health/#tab=tab_1 . Accessed on: 12 Feb. 2024.
31. Aberastury A, Knobel M. Normal adolescence: a psychoanalytic approach. Trans. SMG Ballve. Porto Alegre: Artes Médicas, 1989.
32. Gaete V. Development psychosocial of the teenager.rev Chil Pediatr 2015 dic; 86(6): 436-43. Available at: <http://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0370-41062015000600010&lng=es&nrm=iso>. Accessed on: 24 Feb. 2024.
33. Saito MI, Silva LE. Adolescence: prevention and risk. São Paulo: Editora Atheneu, 2001.
34. Vitalle MS, Silva FC, Pereira AM, Weiler RM, Niskier SR, Schoen TH, 2019. Adolescent medicine: fundamentals and practice. Rio de Janeiro: Atheneu, 2019. 680p.
35. Ehlers A, Clark DM. The cognitive model of posttraumatic stress disorder. Behav Res Ther. 2000 Apr; 38(4): 319-45. doi: 10.1016/s0005-7967(99)00123-0.
36. Kaplan EH. Congenital absence of vagina. Psychiatric aspects of diagnosis and management. NY State J Med 1968 July; 68 (14):1937-41. PMID: 5241707.

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Factors Associated with Mortality in Covid-19 Patients Hospitalized in Conakry's CT-EPI, from 2020 to 2022

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Summary- Introduction: The extent of morbidity and mortality linked to the Covid-19 disease in Guinea has highlighted the need for effective and efficient preparedness and response activities to break the chain of transmission of the disease. Covid-19 response activities are among the critical activities we must interrupt the chains of transmission and combat outbreaks of the disease with epidemic potential in Africa.

Methodology: Our study population consisted of patients hospitalized in the CT-Epi of Conakry, aged of all ages identified in the care database. This was an analytical cross-sectional study made from the database of hospitalized people infected with Covid-19 in the CT-Epi of Conakry in Guinea in 2022.

Keywords: covid-19, comorbidities, CT-Epi conakry, binary regression.

GJMR-K Classification: NLM Code: WC 515

FACTORSASSOCIATEDWITHMORTALITYINCOVID19PATIENTSHOSPITALIZEDINCONAKRYSCTEPIFROM2020TO2022

Strictly as per the compliance and regulations of:

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Methodology: Our study population consisted of patients hospitalized in the CT-Epi of Conakry, aged of all ages identified in the care database. This was an analytical cross-sectional study made from the database of hospitalized people infected with Covid-19 in the CT-Epi of Conakry in Guinea in 2022. A binary logistic regression was carried out to identify the factors associated with the mortality of Covid-19 patients with comorbidity hospitalized in CT-Epi in Conakry.

Results: In total, 10,404 Covid-19 patients were included in the study. Patients infected with Covid-19 in the age groups of 40-59 years, 60 years and over had a risk of death increased by 3 times respectively (OR = 2.99; 95% CI = [2.17-4.10]; p = 0.01) and 11 times (OR = 11.23; 95% CI = [8.42-14.98]; p = 0.000) more than Covid-19 infected patients in the 0-39 range years adjusting for other factors. Patients infected with Covid-19 who were hospitalized at CT-Epi in Gbessia compared to those hospitalized at the Donka National Hospital had a risk of death multiplied by18(OR=18.90;95% CI = [13.70-26.08]; p =0.000); holding the other variables constant in the model. Patients infected with Covid-19 hospitalized at the CT-Epi at Camp Alpha had a 78% lower risk of dying (OR = 0.22; 95% CI = [0.09-0.50]; p = 0.000), compared those hospitalized at the Donka National Hospital, all other things being equal. Patients suffering from Covid-19 associated with diabetes alone had a 5-fold increased risk of dying (OR =5.20; 95% CI = [2.45-11.04]; p = 0.000) compared to those who did not suffer from diabetes, maintaining the other findings in the model. Patients suffering from Covid-19 in combination with HIV alone had a 6 times increased risk of dying (OR = 6.59; 95% CI = [2.50-17.40]; p = 0.000) compared to those which there was no association, adjusting for the other variables. Patients suffering from Covid-19 and several comorbidities had a twice as high risk of dying (OR = 2.57; 95% CI = [1.66-4.4.00]; p = 0.000) compared to those which had not, adjusting for the other variables.

Conclusion: During the emergencies of the Covid-19 outbreak in Guinea, the proportion of deaths due to comorbidities was 43.7%. The response to the outbreak through the dispatch of mixed teams and the management of confirmed cases and the strengthening of epidemiological surveillance has reduced the risk of transmission of the virus in the country. The factors that determine morbidity and mortality are age, CT-Epi, diabetes, HIV & several comorbidities.

Keywords: *covid-19, comorbidities, CT-Epi conakry, binary regression.*

I. Introduction

Coronavirus disease (Covid-19) caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a pandemic that has resulted in several thousand confirmed cases and deaths. (2). The mortality rate around the world shows variations that merit evaluation (2). It has been shown that co-morbidities are frequently associated with Covid-19 and constitute risk factors for the severity of the disease (3).

In their study, Sina et al found that risk factors are associated with morbidity and mortality of CHD 2019 in several countries, including Central and Eastern Europe, Bangladesh, Brazil, China, India, Iran, Pakistan and Turkey. They found that there were more confirmed cases and deaths among men than women in most of these countries (see reference by Sina et al). In addition, the case-fatality rate for men was higher than for women (4). There are factors associated with the occurrence of morbidity and mortality linked to Covid-19, but these morbidity and mortality phenomena are significantly lower in sub-Saharan Africa than in high-income countries (5, 6).

In sub-Saharan Africa, some authors have reported that non-communicable diseases (NCDs) are associated with the occurrence of mortality in patients

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with severe Covid19, notably cardiovascular disease (including hypertension) with a proportion of 24.6%, diabetes with 18.4% and chronic obstructive pulmonary disease (asthma) with 5.3%. The data compiled by Skip LA et al to assess the epidemiological and clinical characteristics of the Covid-19 cases who died throughout the African region south of the Sahara. More specifically, data on sex, age, underlying conditions and mode of detection were associated with the occurrence of deaths (7). In Burkina Faso in 2020, they point out that nearly half of confirmed Covid19 cases had a history of hypertension (45.5%), diabetes (21.2%) or other cardiovascular or pulmonary conditions, such as stroke, embolism or heart disease (9.1%) (7). In Mali in 2021, Soumana et al showed that mortality in patients infected with covid19 was associated with factors such as obesity, diabetes, hypertension, COPD, smoking, immunosuppression and chronic renal failure (8). In Senegal in 2022, Maryam Diarra et al found that patients aged over 65 and those suffering from hypertension, cardiovascular disease and diabetes were strongly associated with death (9).

In response to the first case of the pandemic in Guinea, the country has set up care facilities. According to data from the Agence Nationale de Sécurité Sanitaire (ANSS) for August 2022, 733,221 tests have been carried out in the country, of which 37,496 have been confirmed, with a positivity index of 5.1%. 37,302 patients have been hospitalized in the various CT-Epi units, of whom 36,787 have been cured, representing a cure rate of 98.1%. A total of 785 deaths due to Covid-19 were recorded, including 447 hospital deaths (10).

Despite the evidence of the association between comorbidities and the occurrence of morbidity and mortality in Covid-19- infected patients, there is insufficient information on the factors influencing the mortality of Covid-19-infected patients with comorbidities in the epidemiological treatment centers of Conakry in Guinea from 2020 to 2022. It therefore seems appropriate to analyze the factors associated with mortality in Covid-19-infected patients hospitalized in Conakry's CT-Epi from 2020 to 2022.

II. Materials and Methods

a) Study Sites

The CT-Epi of Donka, Gbessia and Camp Alpha Yaya DIALLO served as the setting for our study. These CT-Epi are part of the six (06) epidemiological treatment centers in the capital Conakry, namely Nongo, Camp Alpha Yaya, Gbessia, Maison Centrale, Donka and Kenien. (21).

b) Study Design

Secondary data collected in the Conakry CT-Epi on patients infected with Covid-19 from 12 March 2020 to 31 December 2022 were analyzed.

c) Target Population

Suspected cases of Covid-19 who were hospitalized in three CT-Epi in Conakry, namely Donka, Gbessia and Camp Alpha Yaya during the collection period.

d) Study Population

The study population consisted of all patients infected with Covid-19 confirmed by Gold standard RT-PCR and hospitalized in CT-Epi.

e) Calculating Statistical Power

The sample size was 820 disabled people aged between 15 and 60 and the statistical power of this sample was calculated using the following parameters:

For: n= 10 404

The first-species error $\alpha = 0.05$

- An expected prevalence of 0.4
- An observed prevalence of 0.5

This gives a statistical power of (1-ß) = 99%.

f) Choice of Variables

i. *Dependent Variable*

The dependent variable in this study was death, which was measured in people infected with Covid-19 and hospitalized at the Donka, Gbessia and Camp Alpha Yaya CT-Epi in Conakry.

ii. *Independent Variables*

The variables were age, sex, marital status, level of education, patient residence, diabetes alone, hypertension alone, HIV alone, TB alone, chronic respiratory diseases, associated comorbidities and epidemiological treatment centers (CT-Epi).

g) Operational Organization of Data Collection

A secondary analysis of the data collected on patients infected with COVID-19 was performed. The main objective of this study was to analyze the factors associated with mortality in patients infected with Covid-19 at the Gbessia epidemiological treatment center in Conakry, Republic of Guinea.

Ethical Considerations

Data collection was approved by the National Health Research Ethics Committee of the Republic of Guinea.

III. Data Processing

The study data were collected in the Donka, Gbessia and Camp Alpha Yaya CT-Epi in Conakry. They were used for this work. After exploration of this database, our variables were selected. The selected variables were recorded in accordance with the different predefined modalities. The dependent variable was formed from the death variable. Out of a total of 10,416 observations, twelve (12) variables (marital status,

profession, level of education and residence of patients, etc.) had missing values. Given the high proportion of missing values (over 15%), it was decided to exclude them from our analysis.

IV. Data Analysis

The first stage of the analysis was a descriptive analysis of all the selected variables. The socio-demographic characteristics of the study subjects were described. Numbers and percentages were calculated for each qualitative variable selected and compared using Pearson's chi2 test.

The bivariate analysis consisted of estimating the association between the dependent variable and each of the selected independent variables using simple logistic regression. This analysis yielded crude Odds Ratios (OR) with their 95% confidence intervals (CI). A significance level of 0.2% was used to include the explanatory variables in the final model.

For the multivariate analysis, a standard multivariate binary logistic regression was used to analyze the factors associated with mortality in patients infected with Covid-19, yielding adjusted odds ratios (AORs). A p value < 0.05 was considered statistically significant.

V. Results

We included 10,404 Covid-19-infected patients hospitalized in the epidemiological treatment centers in Conakry in our analysis.

Table I presents some socio-demographic characteristics and the distribution of patients infected with COVID-19 hospitalized in the Conakry CT-EPI. Males were more represented with a proportion of 61.6%, and the 0-39 age group was the most represented with 52.4%. The Donka CT-Epi had the highest number of hospitalized patients with a percentage of 87.9%. Approximately 6% of patients had a co-morbidity.

Table I: Description of Covid-19-Infected Patients Hospitalized in Conakry's CT-Epis, 2020-2022

Variables	Number (N=10,404)	Percentage (%)
Gender		
Male	6408	61,59
Female	3996	38,41
Age (year) 0 -39		
40-59	5422	52,11
60 and over	2847	27,36
	2135	20,52
CT-EPI		
Donka	9145	87,90
Camp AlphaYaya Gbessia	749	7,20
	510	4,90
Comorbidities		
No	9778	93,98
Yes	626	6,02

Figure 3 shows the proportion of deaths among Covid-19 patients hospitalized in Conakry's CT-EPI. 6% of hospitalized patients died during the study period.

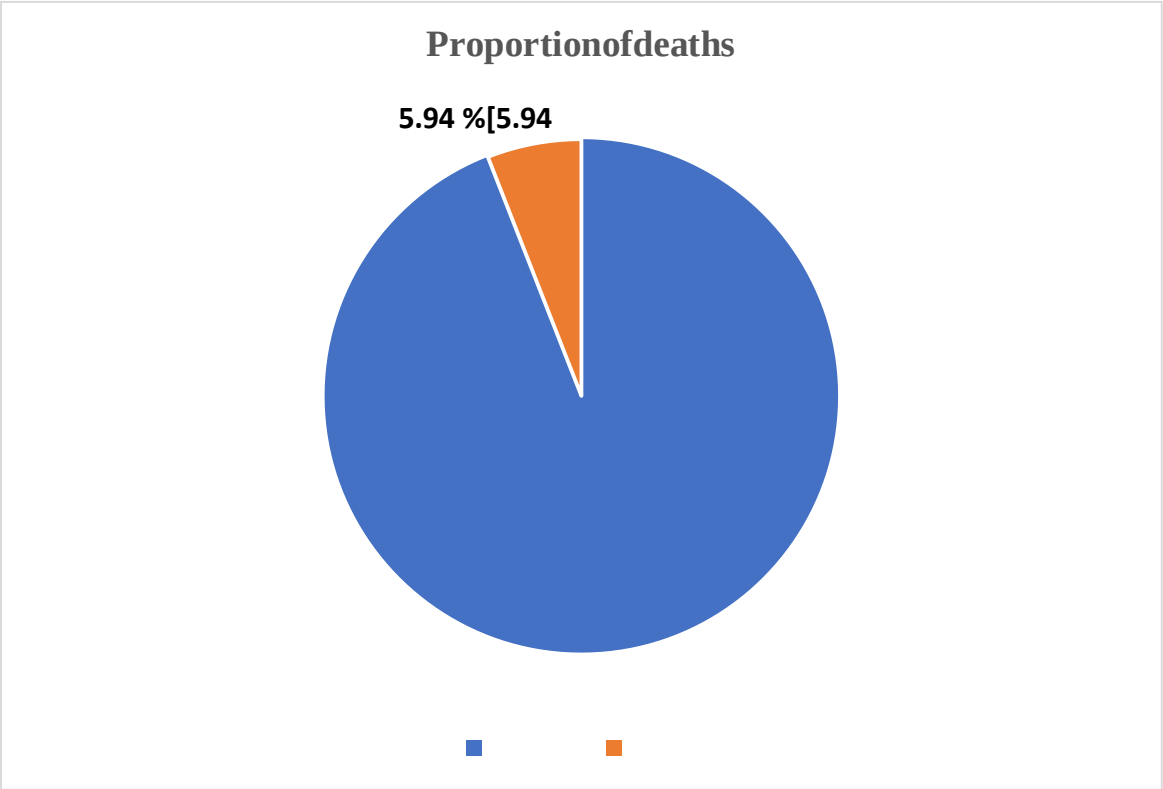

Figure 1: Proportion of Deaths among Covid-19-Infected Patients Hospitalized In Conakry's CT-EPI, 2020-2022

Table III shows the distribution of deaths among patients hospitalized in the Conakry CT-EPI according to characteristics. The age group 60 years and over was the most represented with 66.3%. More than half (51.9%) occurred in the Gbessia CT-EPI. The proportion of deaths due to comorbidities was 43.7%.

Table II: Breakdown of Deaths among Covid-19-Infected Patients Hospitalized in Conakry's CT-EPI By Characteristics, 2020- 2022

Variables	DEATH		p
	Number (N=618)	Percentage (%)	
Gender			
Male Female	387	62,62	
	231	37,38	
			0,587
Age (year)			
0 -39	69	11,17	
40-59	139	22,49	
60 and over	410	66,34	**<0,001**
CT-EPI			
Donka	291	47,08	
Camp Alpha Yaya	6	0,97	
Gbessia	321	51,94	**<0,001**
Comorbidities			
No	348	56,31	
Yes	270	43,69	**<0,001**

Figure 4 shows the distribution of deaths by type of comorbidity. Around 45% of patients with diabetes alone died. More than a third (36.7%) of patients with cardiovascular disease alone and 36.4% of patients with HIV alone died. Two-thirds (66.7%) of patients with tuberculosis alone died. More than half of the patients with respiratory diseases alone (53.8%) and associated comorbidities (53.9%) had died.

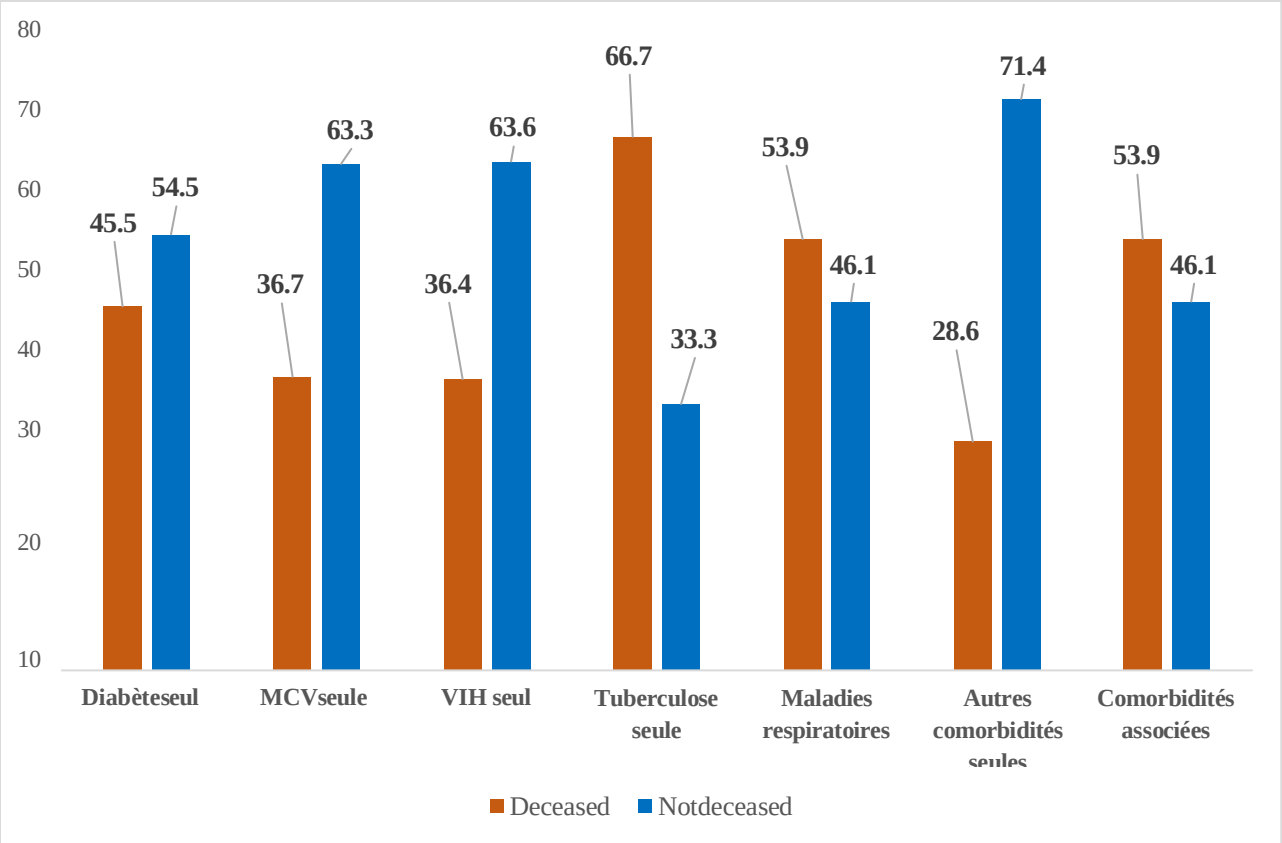

Figure 2: Proportion of Deaths by Type of Comorbidity among Covid-19-Infected Patients Hospitalized in Conakry's CT-EPI, 2020 - 2022 (N = 10 404)

Table IV shows the results of the bivariate logistic regression analysis. In the univariate analysis, the variables significantly associated with death in patients infected with Covid-19 were age, CT-Epi, diabetes alone, HIV alone, TB alone, chronic respiratory disease alone, other comorbidities alone and associated comorbidities.

Compared with Covid-19 patients aged 0-39 years, patients aged 40-59 years and 60 years and over were respectively 4 times (OR= 3.98; CI95% = 2.97 - 5.33; p= 0.000) and 19 times (OR=19.05; CI95% = 14.67 -24.72; p= 0.000) more likely to die from Covid-19. Compared with Covid-19-infected patients hospitalized at the Donka National Hospital, patients hospitalized at the Gbessia CT-Epi were 18 times more likely to die from their disease (OR=18.90; 95% CI = [13.70 - 26.08] p= 0.000). In contrast, patients hospitalized at the CT-Epi in the Alpha Yaya camp had a 75% lower probability of dying than patients hospitalized in Donka (OR = 0.25; 95% CI = [0.11- 0.55] p= 0.000).

Compared with non-diabetic Covid-19-infected patients, patients with diabetes alone had 13 times the risk of dying from Covid-19 (OR = 13.81; 95% CI = [8.45 - 22.60] p= 0.000). Compared with uninfected patients, patients infected with HIV alone were 9 times (OR = 9.21; 95% CI = [4.5 - 18.80] p= 0.000) more likely to die from their infection; patients infected with TB alone were 32 times more likely (OR = 31.97; 95% CI = [7.98 - 128.14] p= 0.000) ; respiratory disease alone, 18 times more likely (OR = 18.67; 95% CI = [6.26 - 55.73] p= 0.000); other comorbidities alone, 6 times more likely (OR = 61.35; 95% CI = [1.23 - 32.80] p= 0.000) and associated comorbidities 22 times more likely (OR = 22.33; 95% CI = [16.74- 29.79] p= 0.000) to die from their condition.

Table III: Factors Associated with the Occurrence of Death among Covid-19-Infected Patients Hospitalized in Conakry's CT- Epi, 2020-2023 in Bivariate Analysis

Features	Crude Oddsratio (95% CI)	p
Gender		
Male Female	Ref.	
	0,95(0,81-1,13)	0,587
Age		
(year)	Ref.	<0,001
0 - 39	3,98(2,97-5,33)	<0,001
40-59	19,05(14,67-24,72)	
60 and over		
CT-EPI		<0,001
Gbessia	51,68(41,71-64,03)	<0,001
Camp Alpha Yaya Donka	0,25(0,11-0,55)	
	Ref.	
Diabetes	Ref.	<0,001
alone No	13,81(8,45-22,60)	
Yes		
CVD alone No		
Yes	Ref.	
	10,79(8,33-13,99)	<0,001
HIV	Ref.	<0,001
Alone	9,21(4,51-18,80)	
No		
Yes		
TB	Ref.	
only No	31,97(7,98-128,14)	<0,001
Yes		
Respiratory disease	Ref.	
alone No	18,67(6,26-55,73)	<0,001
Yes		
Other comorbidities	Ref.	
alone No	6,35(1,23-32,80)	0,027
Yes		
Associated	Ref.	
comorbidities No	22,33(16,74-29,79)	<0,001
Yes		

Table V shows the results of the multivariate binary logistic regression analysis in explaining the occurrence of death in Covid- 19 infected patients. The variables age, CT-Epi, diabetes alone, CVD alone, HIV alone, TB alone, chronic respiratory disease alone, other comorbidities alone and associated comorbidities were reintroduced into the multivariate logistic regression model. This final model involved 10,404 observations. The explanatory variables that were significantly associated with death at a threshold <2% were the age ranges of Covid-19 infected patients, CT-Epi, diabetes alone, HIV alone and associated comorbidities. Covid-19-infected patients in the 40-59 age bracket had a 3-fold increased risk of death (AOR = 2.99; CI95% = [2.17-4.10]; p = 0.01) and those aged 60 and over an 11-fold increased risk of death (AOR = 11.23; CI95% = [8.42-14.98]; p = 0.000) compared with Covid-19-infected patients in the 0-39 age bracket when adjusting for other factors.

Covid-19-infected patients hospitalized at the CT-Epi de Gbessia compared with those hospitalized at the Hopital National Donka had an 18-fold increased risk of death (AOR= 18.90; CI95% = [13.70- 26.08]; p = 0.000); holding other variables constant in the model. Covid-19 patients hospitalized at Camp Alpha CT-Epi had a 78% lower risk of death (AOR=0.22; 95% CI = [0.09-0.50]; p=0.000), compared with those hospitalized at Donka National Hospital. Patients with

Covid-19 associated with diabetes alone had a 5-fold increased risk of death (OR =5.20; 95% CI = [2.45-11.04]; p = 0.000) compared with those without diabetes, holding other constants in the model. Patients with Covid-19 in combination with HIV alone had a 6-fold increased risk of death (OR =6.59; 95% CI = [2.50-17.40]; p = 0.000) compared with those without HIV, adjusting for other variables. Patients with Covid-19 and several comorbidities had a 2-fold increased risk of death (OR =2.57; 95% CI = [1.66- 4.00]; p = 0.000) compared with those without, adjusting for other variables.

Table IV: Factors Associated with the Occurrence of Death in Patients Infected with Covid-19 Hospitalized in Conakry's CT-Epi, 2020-2023, Multivariate Analysis

Features	Adjusted odds ratio (95% CI)	p
Age (year) 0 -39		
40-59	Ref.	
60 and over	2,99 (2,17-4,10)	**<0,001**
	11,23 (8,42-14,98)	**<0,001**
CT-EPI		
Gbessia	18,90 (13,70-26,08)	**<0,001**
Camp Alpha Yaya Donka	0,22 (0,09-0,50)	**<0,001**
	Ref.	
Diabetes alone No	Ref.	
Yes	5,20 (2,45-11,04)	**<0,001**
CVD alone No	Ref.	
Yes	1,52(1,00-3,31)	0,052
HIV Alone		
No	Ref.	
Yes	6,59(2,50-17,40)	**<0,001**
Tuberculosis alone No	Ref.	
Yes	4,00(0,85-18,91)	0,080
Chronic respiratory diseases alone No	Ref.	
Yes	0,93(0,27-3,25)	0,912
Other comorbidities alone No	Ref.	
Yes	0,58(0,10-3,53)	0,555
Associated comorbidities No	Ref.	
Yes	2,57(1,66-4,00)	**<0,001**

VI. Discussion

The general objective of this study was to analyze the factors associated with mortality in patients with Covid-19 hospitalized in the Conakry CT-Epi in the Republic of Guinea from March 2020 to December 2022.

a) The Overall Prevalence of Mortality in the Covid-19 Infected Population Hospitalized in the Conakry CT-EPI

The death rate among Covid-19-infected patients hospitalized in Conakry's CT-Epi is not negligible, at 6%, but it is low compared with death rates in northern countries. This result may be linked to a

younger population, which limits the risk and number of deaths, and a favorable climate (hot and humid), which reduces viral transmission. This death rate could be underestimated by the fact that several cases of death were notified at community level and were not included in the total number of deaths occurring in the CT-Epi.

This result is similar to those found by certain researchers in Africa, who reported the same realities in 2020, with an even lower number of deaths per standardized population (22). Although reduced, the trend is identical for North Africa, which has 5 times fewer cases and 10 times fewer deaths per standardized population than the regions of Europe (22). Other studies have documented the overall mortality of patients infected with Covid-19 at 5%, which is close to our result (23).

Overall prevalence of mortality due to co-morbidities in Covid-19 patients hospitalized in Conakry's CT-EPIs In our analysis, we found high proportions of co-morbidities among patients who died of Covid-19 in the Conakry CT-Epi. This could be explained by the realities of African countries, with the epidemiological transition from infectious diseases to chronic diseases and the precarious health situation. Our results are in line with previous research which has shown a high proportion of co-morbidities in patients who die of Covid-19. A study conducted in South Africa by Waasila Jassat et al (24) reported that in 2022, 37.4% of patients who died from Covid-19 had hypertension, 27.4% had diabetes, 9.1% were living with HIV, 3.6% had tuberculosis (24).

Laura Skrip et al demonstrated in Burkina Faso in 2020 that the presence of underlying conditions was high among cases of death in Covid-19 patients. They also pointed out that almost half of confirmed Covid-19 cases had a history of hypertension (45.5%), diabetes (21.2%) or other cardiovascular or pulmonary conditions, such as stroke, embolism or heart disease (9.1%). (7).

Factors associated with the occurrence of death in patients infected with COVID-19 hospitalized in the Conakry CT-Epi, multivariate analysis.

With regard to the risk factors for death associated with Covid-19 infection in patients, our study showed that the age groups of patients infected with Covid-19, the epidemiological treatment centers in Conakry (CT-Epi), diabetes alone, HIV alone and associated comorbidities accounted for this high case-fatality rate.

In our analysis, age groups appear to be risk factors for death among Covid-19 patients, with a more pronounced emphasis on the 60+ age group, which is 11 times more likely to die. In our context, this excess mortality among elderly patients could be explained by the association of co-morbidities in elderly subjects, which would contribute to a decline in immunity and precarious health conditions. In Mali, Bourahima Koné et al found that the age group [65-75] was the most affected, with 31.06%. (25). Kombila U. D. et al in Gabon in 2022, found that age over 65 was the main independent risk factor for death ($p< 0.001$; OR = 4.632 IC95% [2.243-9.565]) (26). Other authors have also shown clear evidence for the association between mortality in Covid-19 patients and age and have also explained that age is a risk factor for mortality (27).

The epidemiological treatment center (CT-Epi de Camp Alpha Yaya) appears in our study to be a protective factor for hospitalized patients infected with Covid-19. However, another treatment center (CT-Epi de Gbesia) appears to be a risk factor for patients. It should be noted that we did not find any data in the scientific literature concerning the treatment centers for hospitalized patients infected with Covid-19. However, it should be noted that the CT-Epi at Camp Alpha Yaya did not have a resuscitation unit for the management of severe cases, so all severe cases from the CT-Epi at Camp Alpha Yaya were referred to the CT-Epi at Gbessia.

According to a multicenter study carried out by the World Health Organization (WHO) in 2020, prevention and treatment services for non-communicable diseases (NCDs) with co-morbidities have been severely disrupted since the start of the Covid- 19 pandemic. This study was carried out in 155 countries by the WHO, which confirms that the impact is global, but that low- income countries in sub-Saharan Africa are the hardest hit. Health services have been partially or completely disrupted in many countries. This situation exposes patients suffering from NCDs (diabetes, arterial hypertension, heart disease, kidney disease, obesity, etc.) to the risk of serious illness and death due to Covid-19. In more than half (53%) of the countries responding to the survey, hypertension treatment services are partially or totally disorganized; in 49% of countries, services for treating diabetes and its complications are disorganized; in 42% of countries, cancer treatment services are disorganized; and in 31% of countries, cardiovascular emergency services are disorganized. (28).

In Yaoundé, Mendimi Nkodo J.M et al also explained in their analysis that the risk of death was higher in infected patients with a combination of comorbidities such as arterial hypertension, diabetes, cardiovascular disease, obesity, chronic kidney disease, tuberculosis, HIV, etc., which undoubtedly explains the systemic dysfunction of the blood microcirculation in the lungs and other organs. (29).

A study carried out in South Africa by Waasila Jassat et al (24) reported that among patients who died in 2022 from Covid-19: 37.4% had hypertension, 27.4% had diabetes, 9.1% were living with HIV and 3.6% had tuberculosis. It also found that other associated factors were chronic heart disease, chronic kidney disease, etc.

(24). For Peter et al in South Africa in 2020, the triple burden of Covid-19, tuberculosis and the human immunodeficiency virus is one of the major global health challenges of the 21st century. Tuberculosis is a risk factor for Covid-19 in terms of both severity and mortality (30).

VII. Limitations of the Study

Our study was based on collected data, and we came up against shortcomings in filling in the forms, which made it impossible to use information on gender, level of education, profession, economic level and place of residence. The type of study used in our work is a cross-sectional survey which makes it possible to establish an association between death and the various explanatory variables but cannot establish a causal link. Despite its limitations, this study has the merit of laying the foundations for an analysis of the factors associated with death in Covid-19-infected patients hospitalized in the epidemiological treatment centers in Conakry.

VIII. Conclusion

Our study determined the factors associated with the occurrence of death in Covid-19-infected patients hospitalized in the Conakry epidemiological treatment centers from 2020 to 2022. The age groups of patients infected with Covid-19, the epidemiological treatment centers in Conakry (CT-Epi), diabetes alone, HIV alone and associated comorbidities are variables that influence the occurrence of death in patients infected with Covid-19. Further quantitative and qualitative research is needed to determine the best means of correctly measuring and also determining the factors associated with death in patients with co-infection comorbidities and Covid-19, who constitute a vulnerable population.

References Références Referencias

1. Sanyaolu A, Okorie C, Marinkovic A, Patidar R, et al. Comorbidity and its Impact on Patients with COVID-19. SN Compr Clin Med. 2020; 2:1069-76.
2. Otitoloju AA, Okafor I, Fasona M, Bawa-Allah KA, et al. Covid-19 pandemic: examining the faces of spatial differences in the morbidity and mortality in sub-Saharan Africa, Europe and USA. medRxiv. 2020 Apr 24;
3. Lounici A, Benmekki A, Ghenou A, Tahir S, Belmimoune A, Zini S, et al. Clinical characteristics of diabetic patients hospitalised for Covid-19 over a one-year period. Revue Algérienne d'allergologie et d'immunologie clinique. 2021 May;6(2):2543-3555.Tazerji SS, Shahabinejad F, Tokasi M, Rad MA, Khan MS, Safdar M, et al. Global data analysis and risk factors associated with morbidity and mortality of Covid-19. Gene Rep. 2022 Mar; 26:101505.
4. Zahra Diop B, Ngom M, Pougué Biyong C, et al. The relatively young and rural population may limit the spread and severity of Covid-19 in Africa: a modelling study. BMJ Glob Health. 2020; 5:2699.
5. Njenga MK, Dawa J, Nanyingi M, Gachohi J, Ngere I, Letko M, et al. Why is There Low Morbidity and Mortality of Covid-19 in Africa? Am J Trop Med Hyg. 2020 Aug 1; 103(2): 564.
6. Skrip LA, Selvaraj P, Hagedorn B, Ouédraogo AL, Noori N, Orcutt A, et al. Seeding Covid-19 across Sub-Saharan Africa: An Analysis of Reported Importation Events across 49 Countries. Am J Trop Med Hyg. 2021 May 5; 104(5):1694-702.
7. Soumana C, Youssouf M, Mr C, Mahamane D, Mr D, Massaoulé B, et al. Organ dysfunction during sars-cov-2 respiratory infection in Mali. in 2021.
8. Diarra M, Barry A, Dia N, Diop M, Sonko I, Sagne S, et al. First wave Covid-19 pandemic in Senegal: Epidemiological and clinical characteristics. PLoS One. 2022 Sep 1; 17(9): e0274783.
9. Weekly epidemiological information meeting Agence Nationale de Sécurité Sanitaire (ANSS), 11 August 2022.
10. WHO-2019-nCoV-Surveillance-Case-Definition-20 22.1-eng.
11. Chan JFW, Yuan S, Kok KH, To KKW, Chu H, Yang J, et al. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. The Lancet. 2020 Feb 15; 395(10223):514-23.
12. Liu Y, Gayle AA, Wilder-Smith A, Rocklöv J. The reproductive number of Covid-19 is higher compared to SARS coronavirus. J Travel Med. 2020 Mar 1; 27(2).
13. Gehanno JF, Bonneterre V, Andujar P, Pairon JC, Paris C, Petit A, et al. Evidences for a possible airborne transmission of SARS-CoV-2 in the Covid-19 crisis. Archives des Maladies Professionnelles et de l'Environnement. 2020 Aug 1; 81(4): 306- 15.
14. WHO. Covid-19 Weekly Epidemiological. 2023 May.
15. Post LA, Argaw ST, Jones C, Moss CB, Resnick D, Singh LN, et al. A surveillance system for SARS-CoV-2 in sub-Saharan Africa: a persistence and transmission modelling study to inform policy. J Med Internet Res. 2020 Nov; 22(11): e24248.
16. Garcia J, Torres C, Barbieri M, Camarda CG, Cambois E, Caporali A, et al. Differences in Covid-19 mortality: a consequence of imperfections and diversity in data collection systems. Population (Wash DC). 2021 Jun 22; Vol. 76(1):37-76.
17. Sono-Setati ME, Mphekgwana PM, Mabila LN, Mbombi MO, Muthelo L, Matlala SF, et al. Health System- and Patient-Related Factors Associated with Covid-19 Mortality among Hospitalized

Patients in Limpopo Province of South Africa's Public Hospitals. Healthcare (Switzerland). 2022 Jul 1; 10(7):1338.
18. Donamou J, Bangoura A, Camara LM, Camara D, Traoré DA, Abékan RJM, et al. Epidemiological and clinical characteristics of Covid-19 patients admitted to intensive care at Donka Hospital in Conakry, Guinea: descriptive study of the first 140 cases hospitalised. Anesthesia & Intensive Care. 2021 Mar; 7(2):102-9.
19. Ministry of Health and Public Hygiene. Plan national de préparation et de riposte à l'infection éventuelle par le nouveau coronavirus Covid-19. 2020.
20. Ministry of Health. Projet de préparation et de réponse de la Guinée au Covid 19 (P174032). Environmental and Social Management Framework (CGES). In 2021.
21. Hardy JL, Flori P. Specific epidemiological features of Covid-19 in Africa: a current or future public health concern? Ann Pharm Fr. 2021 Mar 1;79(2):216.
22. Jaspard M, Sow MS, Juchet S, Dienderé E, Serra B, Kojan R, et al. Clinical presentation, survival and factors associated with mortality: a prospective study in three Covid-19 centres in West Africa. Infect Dis Now. 2021 Aug; 51(5): S56-74.
23. Jassat W, Cohen C, Tempia S, Masha M, Goldstein S, Kufa T, et al. Risk factors for Covid-19-related in-hospital mortality in a high HIV and tuberculosis prevalence setting in South Africa: a cohort study. Lancet HIV. 2021 Sep 1; 8(9): e554-67.
24. Koné B, Youssouf Dembélé A, Diarra SS, Berthé I, Koné A, Boly A, et al. Clinical and epidemiological characteristics of Covid 19 deaths in Mali. Mali médical. 2021;36(2):8-13.
25. Kombila U.D, Manomba BC, Igala M., Ngomas JF, et al. Clinical course and prognostic factors for death in patients infected with SARS-CoV-2 hospitalised in the COVID infectiology sector of the university hospital centre (CHU) in Libreville, Gabon. Rev Malad Respir Actual. 2022; 4(1): 139-40.
26. Wu C, Chen X, Cai Y, Xia J, Zhou X, Xu S, et al. Risk Factors Associated with Acute Respiratory Distress Syndrome and Death in Patients With Coronavirus Disease 2019 Pneumonia in Wuhan, China. JAMA Intern Med. 2020 Jul 1; 180(7): 934-43.
27. WHO. Covid-19 has serious repercussions on health services treating non-communicable diseases. 2020 Jun 1.
28. Mendimi Nkodo JM, Ngah Komo ME, Ngo Pambe CJ, Poka Mayap V, et al. Morbidity and Pulmonary Histomorphology of Covid-19 Patients in Yaoundé. Health Sci Dis. 2023 Mar; 24(3): 37-44.
29. Tamuzi JL, Ayele BT, Shumba CS, Adetokunboh OO, Uwimana-Nicol J, Haile ZT, et al. Implications of Covid-19 in high burden countries for HIV/TB: A systematic review of evidence. BMC Infect Dis. 2020 Oct 9; 20(1): 744.

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f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.

Format Structure

It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

All manuscripts submitted to Global Journals should include:

Title

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Eletronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution at final image size ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs): >350 dpi; figures containing both halftone and line images: >650 dpi.

Color charges: Authors are advised to pay the full cost for the reproduction of their color artwork. Hence, please note that if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a Color Work Agreement form before your paper can be published. Also, you can email your editor to remove the color fee after acceptance of the paper.

Tips for writing a good quality Medical Research Paper

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of medical research then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.

6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection.

Segment draft and final research paper: You have to strictly follow the template of a research paper, failing which your paper may get rejected. You are expected to write each part of the paper wholly on your own. The peer reviewers need to identify your own perspective of the concepts in your own terms. Please do not extract straight from any other source, and do not rephrase someone else's analysis. Do not allow anyone else to proofread your manuscript.

Written material: You may discuss this with your guides and key sources. Do not copy anyone else's paper, even if this is only imitation, otherwise it will be rejected on the grounds of plagiarism, which is illegal. Various methods to avoid plagiarism are strictly applied by us to every paper, and, if found guilty, you may be blacklisted, which could affect your career adversely. To guard yourself and others from possible illegal use, please do not permit anyone to use or even read your paper and file.

Criterion for Grading a Research Paper (Compilation) by Global Journals

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals.

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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Global Journal of Medical Research

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