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On Certain Types of Set in Micro Topological Spaces with an Application in Thalassemia Sick

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$N, N' \in (\tau_R(X), \mu \notin \tau_R(X))$.

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ABSTRACT

Introduce new kind of sets called micro-regular open, micro α-open, micro regular α-open, micro general regular α-closed and a basis of micro topology, were introduce in this paper with some properties related to these concepts. Relationships that can be established between micro pre-open, micro regular open, micro α-open, for some of the characteristics were stated and proved. At last this paper identified risk factor for the cause
of splenomegaly in thalassemia patients. In al Mosel city (Ibn al Atheer Hospital).

1. Introduction

In 1990 Hamlet and Jankovic [1] investigated further properties of topological space. Thivagar, was the first scholar, how introduced Nano topology in 2013 [2], he introduced the concept of Nano topological spaces which has been known in terms of universe U subset boundary region and approximation through the utilization of equivalence relation on it. The concept has also been determined as nano closure, nano interior, and nano closed sets. Jayalakshmi and Janaki [3] defined Nrα-open, Ngr α-closed, a relation among nano regular, closed sets, nano α-closed with Ngrα-closed. In 2020 Saleh and Jasim [4] introduced Nrα_0-open, Ngrα_0-closed and the relation of intersection of two Ngrα_0-closed, also Ngrα_0-continuous and Ngrα_0-irresolute. In 2019 chandrasekar [5] introduced the typologies of pre-open and micro sets, micro semi open set; we studied the relationship between microopen set and micro pre-open, microopen set and micro semiopen.

2. Preliminaries

In this part, we recall some definitions which are needed in our work .

Definition 2.1[6]

Consider X as a non-empty arbitrary group, The space of an Infra-topological on X is a set of subdivision group similar the next axioms are satisfying.

(i) φ , $X \in \tau_{iX}$.

(ii)Elements intersection of either subgroup of X.

i.e if $0_i \in \tau_{iX}, 1 \leq i \leq n \rightarrow \cap\, 0_i \in \tau_{iX}$.

Terminology, Infra-topological space has been known as the order group (X, τ_{iX}). we simply say X is Infra-space.

Definition 2.2 [5]

Consider the universe is U as a finite, non-empty group of objects and R let be an equivalence that is connection with U called as the link of indiscernibility. Later on, we divide U into classes with split equivalence. Factors of the same equivalence type have been informed to be indistinguishable with each another. The combination (U,R) is known as the approximate space. Let $X \subseteq U$.

1. X the lowest approximate, is all objects group of with respect to R, which certainly, can be grouped as X is determined by $L_R(X)$. respecting R that is,

$L_R(X) = \cup_{x \in U}\{R(x): R(x) \subseteq X\}$ wherein R(x) determines the equivalent class denoted by $x \in U$.

2. X the upper approximation is all objects' group respecting to R, that might be categorized as X which

determined by $U_R(X)$. Respecting to R therefore, $U_R(X)= \cup_{x\in U}\{R(x) : R(x) \cap X \neq \varphi\}$

3. X regional boundary is all objects' group of respecting R, that could not be categorized as not-X no X which is determined by $B_R(X)$. with regard to R and thus, $B_R(X)=U_R(X)-L_R(X)$.

Definition 2.3 [5]

Consider the universe U, R and U have an even and $\tau_R(X)=\{U,\varphi,L_R(X),U_R(X),B_R(X)\}$ wherein $X \subseteq U$ satisfies the axioms below.

1. U, $\varphi \in \tau_R(X)$
2. Elements' union of either sub-group of $\tau_R(X)$
3. Elements' crossroad of either finite sub-group of $\tau_R(X)$

So, U nano topology is known as $\tau_R(X)$ with regard to X. The space (U, $\tau_R(X)$) is the nano topological space. Factors of known as nano open groups.

Definition 2.4 [5]

The nano topology space (U,$\tau_R(X)$) here $\mu_R(X)$ =$\cup\{N\cup(N' \cap \mu)\}: \in \tau_R(X)$ and known as Micro topology N, N' of $\tau_R(X)$ by μ wherein $\mu \notin \tau_R(X)$.

Definition 2.5 [5]

The micro topology space $(U,\tau_R(X)$, $\mu_R(x))$. with regard to x, wherein $X \subseteq U$ and whether A⊆U, so

1- "A" set micro interior of has been determined as the micro open set union included in A and is determined by Mic-int(A)

2- A set micro closure e known as the cross whole micro closed group including A and is determined by Mic-cl(A)

Definition 2.6[5]

Let $(U, \boldsymbol{\tau_R(X)},\boldsymbol{\mu_R(X)})$"be a micro topological space and $A \subseteq U$,then A said is to be

Micro pre-open set if A⊆Mic-int(Mic-cl(A)).

3. Some new tapes of set in micro topological space

This part the introduce the micro topology basis and several new definition namely micro regular open, micro α-open, micro regular α-open, micro general regular α-closed set and via this concept, we introduce micro topological space. At last many characterizations and some examples were introduced to explain the subject.

Definition 3.1

Let $(U, \tau_R(X),\mu_R(X))$ be micro topological space ,the set

$\beta = \{(\varphi, U, (X), (X)) \cup (N' \cap \mu)\}$ called is basis for the micro topology (X) on U.

Definition 3.2

Let $(U, \boldsymbol{\tau_R(X)},\boldsymbol{\mu_R(X)})$ be a micro topological space and $A \subseteq U$ ", then A said is to be

1- Micro regular open if A=Mic-int(Mic-clA)

2- Micro α-open if A⊆Mic-int(Mic-cl(Mic-int(A))

Definition 3.3

consider $(U, \tau_R(x), \mu_R(x))$ be a micro topological space . and A⊆U, therefore A is known as Micro α-closed(respectivily, Micro regular closed) whether its complement is Micro α- open (Micro regular open).

Theorem 3.1

1- Each Micro regular open set is "Micro-α open".

2- Each Micro regular open set is "Micro-pre-open".

Proof:

1- Consider A as Micro-regular open set ,then A="mic int(A)and mic int(A)⊆mic int(mic cl(mic int(A)),therefore, A⊆"mic"int("mic"cl(mic int(A)), hense A is Micro- α open.

2- let A be Micro-regular open ,then A="mic int"(A),which is ⊆"mic int(mic"cl(A)),then A⊆"mic int(mic" cl(A)),hense A is Micro pre-open.

Remark 3.1

Aforementioned theorems' converse could not be right as the following example show.

Example 3.1

Consider U ={a, b, c, d},U/R={(a},{b, c},{d}} and X={a, c},$\tau_R(X)=\{\varphi, U, \{a\},\{a, b, c\}, \{b, c\}\}$, $\mu = \{b\}$ then

$\mu_R(X) = \{\varphi, U, \{a\},\{a, b, c\}, \{b, c\},\{a ,b\},\{b \}\}$.

The mic-reg open are $\{\varphi, U, \{a\},\{b\}, \{a, b\}, \{b, c\}, \{a, b, c\}\}$.

The mic-α open are $\{\varphi, U, \{a\},\{b\}, \{a, b\},\{b, c\}, \{a, b, c\}, \{a, b, d\}\}$.

The mic-pre-open are $\{\varphi, U, \{a\},\{b\}, \{a, b\}, \{b, c\}, \{a, b, c\}, \{a, b, d\}\}$.

Remark 3.2

From the theorem 3.1 and Remark 3.1 we have the implications (figure 1).

mic-pre-open ⟵ mic-reg-open ⟶ mic-α open

Fig. (1)

Definition 3.4

Micro topological space subgroup A, $(U, \tau_R(x),\mu_R(x))$ is known as a mic-rα open if there is a micro regular open group w ;therefore w⊂A⊂Mic-α cl(A).

Example3.2

Let U={a, b, c, d} , X={a, b} , "U/R={{a},{b, d}, {a, b, c}},then $\tau_R(X)=\{\varphi, U, \{a\}, \{a, b, d\}, \{b, d\}\}$, $\mu = \{b\}$then $\mu_R(X) = \{\varphi, U, \{a\},\{a, b, d\}, \{b, d\},\{a,b\},\{b\}\}$.And

.mic-rα-open = $\{\varphi, U, \{a, b\}, \{a, b, c\}, \{a, b, d\}\}$.

Definition 3.5

Topological micro space subgroup A, $(U, (x),(x))$ is known Mir-grα closed if Mic-cl(Mic-int(A))⊆w, anytime A⊆w and w is smallest mic-rα open containing A .

Theorem 3.2

(i) Each micro-locked set as Mic-grαclosed

(ii)Each micro regular-locked group as Mic-grα closed.

(iii) Each micro-α locked group is Mic-grα closed.

Remark 3.3

Theorem 3.2 converse couldn't not be right as the next example shows.

Example 3.3

Let's "U={a, b, c, d},U/R={{a}, {b, d},{a, b, d}}", let X={a, b} ⊆U ,then

$\tau_R(X) =\{U, \varphi, \{a\}, \{a, b, d\}, \{b, d\}\}$, by μ={b}, then

The micro open groups = $\{\varphi, U, \{a\}, \{a, b, d\}, \{b, d\}, \{b\}, \{a, b\}\}$

The micro locked groups= $\{U, \varphi, \{b, c, d\}, \{c\}, \{a, c\}, \{a, c, d\}, \{c, d\}\}$
The micro regular locked groups = $\{\varphi, U, \{a, c\}, \{b, c, d\}\}$
The Mic-α closed groups= $\{\varphi, U, \{b, c, d\}, \{a, c, d\}, \{c, d, \}, \{a, c\}, \{d\}, \{c\}$
The Mic-grα locked groups= $\{\varphi, U, \{a\}, \{c\}, \{d\}, \{a, d\}, \{c, d\}, \{a, c\}, \{b, c, d\}, \{a, c, d\}, \{b, d\}\}$

Remark 3.4
We have the following consequences out of this Theorem 3.2 and Remark 3.3 (Figure 2)

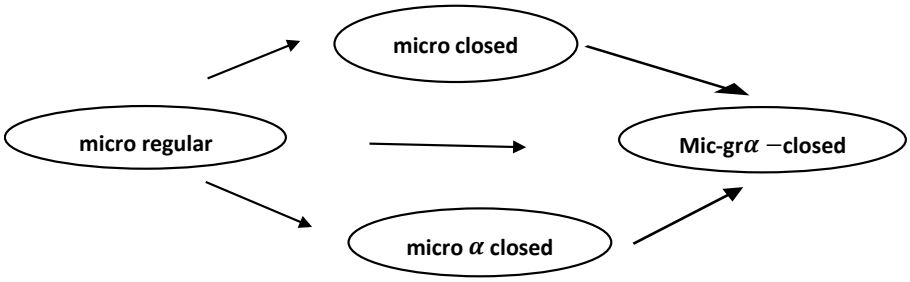

Fig. (2)

Theorem 3.3
The intersection of two Mic-grα-locked groups is also a Mic-grα closed set.

Proof
Consider A and B as two Mic-grα- locked group in $(U, \tau_R(X), \mu_R(X))$. Let Mic-inl(Mic-cl(A)) ⊆ w, Mic-int(Mic-cl(B)) ⊆ w, A⊆ w, B ⊆ w and w is smallest mic-rα open containing A . Then we have, A∩B ⊆ w. Now "Mic-int(Mic-cl(A∩B))"
= "Mic-int(Mic-cl(A))∩Mic-int(Mic-cl(B))⊆w. Thus A∩B is a Mic-grα -locked group in U.

Remark 3.5
Two Mic-gr α-locked groups union is should not Mic-grα – closed set as shown from the following example.

Example 3.4
Consider "U={a, b, c, d}" , X={a, b} and U/R={{a}, {b, d}, {a, b, d}} . then
$\tau_R(X) = \{\varphi, U,$ {a},{b,d},{a,b,d}}, by μ ={b}, then $\mu_R(X) = \{\varphi, X\{a\}, \{a, b, d\}, \{b, d\}, \{b\}, \{a, b\}\}$
Mic-gr α-closed sets = $\{\varphi, U,$ {a},{c},{d},{a,d},{c, d},{a,c},{{b, c, d},{a, c, d},{b,d}}
Here {a}∪{b, d}={a, b, d} be not Mic-grα-closed.

Theorem 3.4
Whether A is a Mic grα -closed subset of , then Mic cl(Mic int(A)) – A doesn't include non-empty Mic $r\alpha$-open

Proof
Suppose A is Mic grα -closed on U. the results are proven through contradiction. Consider F be a Mic – $r\alpha$-open therefore, F⊂Mic cl(Mic int(A)) –A and "F = φ . Then A⊂U–F". As A be Mic grα-locked group, F is Mic rα-open and U–F is micro is also Mic rα-open , we have Mic cl(Mic int(A))⊂U-F. So F ⊂Mic cl(Mic int(A)). Therefore F ⊂ (Mic cl(Mic int(A)) ∩ (U–Mic cl(Mic int(A))) = φ, This is a Contradiction. Hence Mic cl(Mic-int(A)) – A include no non-empty Mic rα-open group.

Theorem 3.5
Let's A be a Mic gr α -locked subset of $(U, \tau_R(X), \mu_R(X))$. Then A is Micro regular closed whether and only whether Mic cl(Mic int(A)) – A is a Mic rα-open

Proof
Suppose that A is a micro regular-closed. Then Mic cl(Micint(A)) = A and Mic cl(Mic int(A)) – A =φ, which is the Mic rα-open. Conversion, let Mic cl(Mic int(A))–A be a Mic rαopen in U. Since A be Mic grα-closed, by theorem 3.4, Mic cl(Mic int(A)) – A does not have any non-empty objects
Mic rαopen set. Then Mic cl (Mic int(A)) – A =φ, hence A is micro regularclosed.

Theorem 3.6
Whether A be Mic grα - locked group of (U,$\tau_R(X)$,$\mu_R(X)$) therefore A⊂B⊂Mic cl(Mic int(A)), therefore
B is Mic grα - locked set in (U,(X),$\mu_R(X)$).

Proof
consider A as a Mic grα - locked subset of (U,$\tau_R(X)$,$\mu_R(X)$) therefore A⊂B⊂Mic cl(Mic int(A)). Let w be a smallest Mic-αopen set containingA therefore, B⊂w, then A⊂w. as A is Mic grα-locked, Mic cl(Mic int(A)⊂w, Now, we have Mic cl(Mic int(B))⊂ Mic cl(Mic int(Mic-cl(Mic-int(A)) = Mic cl(Mic-int(A))⊂w. This implies that B is Mic grα-closed.

4. Applications of Micro Topology
In this section we explain that application message no 257 issued by the college of computer sciences and mathematics at the university of Mosul directed to Ibn al Atheer hospital to acquire data pertaining to the diagnosis of spleen enlargement in thalassemia patients. Data dispersed as follows.

Example 4.1
I took the data of ten thalassemia patients. Post diagnosis results were the following.

Table 1

patients	Hb lower	Hormones,	I hyper ferritin	Result
p_1	√	no	no	Yes
p_2	√	no	√	Yes
p_3	√	no	no	Yes
p_4	√	no	no	Yes
p_5	√	no	no	no
p_6	no	√	no	no
p_7	√	no	√	no
p_8	√	√	√	Yes
p_9	√	no	√	no
p_{10}	√	√	no	no

Here U = {$p1$, $p2$,$p3$,$p4$,$p5$,$p6$, $p7$,$p8$,$p9$, $p10$}, the set of patients and A = { Hb lower , Hormones, I hyper ferritin } It is split into two classes, B= {Hb, Hor,fer} and C = { splenomegaly }. The group of Equivalence types, U/B corresponding to B is given by U/(B) = {{p_1,p_4},{p_2,p_7,p_9}, {p_3,p_5},{p_6}, {p_8}, {p_{10}}}.

Case 1 :(Patients with splenomegaly)

Let X = { $_1$, p_2,p_3, p_4,, p_8}, the set of patient with splenomegaly . Then ,

τ_B(X) = {U, φ, { p_1,,p_4,, p_8 }, { p_1, p_2, p_3,p_4,p_5,p_7,p_8, p_9 }, { p_2,p_3, p_5,p_7,p_9 }." and "μ = {p_2},

$\mu_B(X)$ = {φ, U, { p_2},{p_1,,p_4,, p_8 },{ p_1, p_2,p_4,, p_8 },{ p_1, p_2,p_3,p_4,p_5,p_7, p_8,p_9 } ,{ p_2, p_3,p_5,p_7, p_9}} the basis of

$\mu_B(X)$is given by $\beta_B(X)$ = {φ, U, { p_2 }, { p_1,,p_4,, p_8 },{ p_1, p_2, p_4,,p_8 }, { p_2,p_3,p_5,p_7, p_9 }}."

Phase 1: The attribute when 'I hyper ferritin' is removed from B, U/[(B-fer] = {{p_1, p_2,p_3, p_4,p_5,p_7,p_9 },

{p_6 }, {p_8 },{p_{10}}} and hence $\tau_{B-[fer]}$(X) = { U ,φ, "{p_8 },{p_1, p_2, p_3,p_4,p_5,p_7,p_8, p_9 },

{p_1, p_2, p_3, p_4, ,p_5,p_7,p_9 "}}

and μ = {p_2} , then $\mu_{B-[fer]}(X)$ = {φ, U, {"p_8 },{p_2,,p_8},{ p_2"}, {"p_1, p_2,p_3, p_4,p_5,p_7,p_8, p_9 }

,{p_1, p_2,p_3,p_4,p_5,p_7, p_9"}} and β B-[fer](X) = { φ, U, {p_2 },{"p_8 }, {p_2,,p_8}, {p_1, p_2, p_3,p_4,p_5,p_7,p_9 }}.

Phase 2: The attribute when 'Hormones' is removed from B, U/[B-Hor] = {{p_1,, p_3,p_4,p_5,p_{10} },

{p_2,p_7, p_8,p_9}, { p_6}}, μ = {p_2}, then $\mu_{B-[Hor]}(X)$ = {φ, U, { p_2 },{p_1, p_2,p_3, p_4,p_5, p_7,p_8,p_9, p_{10}}} and

β B-[Hor](X) = { φ ,U, {p_2 } ,{ p_1, p_2, p_3,p_4,p_5,p_7,p_8, p_9,p_{10}}}≠ β B-[fer]

Phase 3: The attribute when 'Hb lower' is removed from , U/R[B-Hb] = {{p_1,,p_3, p_4,p_5 }, { p_2,p_7,p_9},

{p_6,p_{10}} , {$p8$}} and $\tau_{B-\{Hb\}}$(X) = { U, φ, {"p_8 }, { p_1, p_2,p_3,p_4,p_5,p_7, p_8,p_9},{p_1, p_2,p_3, p_4,p_5, p_7,p_9"}} and

μ = {p_2 }, then $\mu_{B-[Hb]}(X)$ = {φ, U, {" p_2 },{p_2,,p_8},{ p_8},{p_1, p_2, p_3,p_4,p_5,p_7,p_9 "},

{"p_1, p_2,p_3,p_4,p_5,p_7, p_8,p_9}} and β B-[Hb](X) = {φ, U, {p_2 },{p_8 },{p_2,, p_8}, {p_1, p_2,p_3, p_4,p_5,p_7,p_9 }}= β B-[fer]

CORE = { Hb lower, I hyper ferritin }.

Case 2 (Patients not with Splenomegaly)

Let X = {p_5, p_6,p_7,$_9$,p_{10}} the set of patients without splenomegaly. then, τ_B(X) = {U, φ, {p_6, p_{10} }, {p_2,"p_7, p_9,p_3,p_5,p_6," p_{10}},{p_2, p_7,p_9,p_3,p_5 "}}and,μ = {P_2},then.$\mu_B(X)$ = {φ, U, {p_6,p_{10} },{P_2},{P_2, p_6,p_{10} } ,{p_2, p_7,p_9,p_3, p_5,p_6,p_{10}},{p_2, p_7,p_9,p_3,p_5}}and

$\beta_B(X)$ = {φ, U, { p_2 }, { p_6,p_{10}, },{ p_2,p_6,, p_{10} },{ p_2,p_7, p_9,p_3,p_5 }}.

Phase 1: The attribute when 'I hyper ferritin'is removed from B, U/R[B-fer] = {{ p_1, p_2,p_3, p_4,p_5,p_7,p_9 },{p_6 },

{p_8},{p_{10}}}Therefore,$\tau_{B-\{fer\}}$(X)={U,φ,{ p_6,p_{10}},{"p_1 ,p_2,p_3, p_4,p_5,p_7,p_9", p_6,p_{10}},{p_1 , p_2, p_3,p_4,p_5,p_7,p_9 }}

andμ = {P_2},then$\mu_{B-[fer]}(X)${φ, U, {p_6,p_{10} },{ P_2},{P_2, p_6,p_{10}},{p_1 , p_2,p_3,p_4,p_5,p_7, p_9},{p_1, $p2$,$p3$, $p4$,$p5$,$p6$,$p7$,$p9$, $p10$}}and$\beta B-[fer]$={U,φ, , {$p2$}{ $p6$,$p10$},, {p_2, $p6$,$p10$},{$p1$, $p2$,$p3$,$p4$,$p5$,$p7$,$p9$ }.

Phase 2: The attribute when ' Hormones ' is removed from B, U/R[B-Hor] = {{ p_1, p_3,p_4,p_5, p_{10} }, , { p_2, p_8,p_7,p_9 },{p_6 }}. Therefore,

$\tau_{B-[Hor]}$(X)={ φ, U, {p_6 },{ p_1,p_3,p_4,p_5, p_{10} ,p_2, p_7,p_8,p_9, p_6},{p_1, p_2,p_3, p_4,p_5,p_7,p_9 , p_{10}}},then

$\mu_{B-[Hor]}(X)${φ, U, {p_6 },{ P_2},{P_2, p_6},{p_1, p_2,p_3, p_4,p_5,p_7,p_8,p_9, p_{10}} and

$\beta_B-[Hor]$={U, φ, , {p_2},, {p_6 },{$P2$, $p6$}, {p_1, p_2,p_3,p_4,p_5,p_7, p_8,p_9, p_{10}}}≠ β B-[fer]

Phase 3: The attribute when 'Hb lower' is removed from , U/R[B-Hb] = {{p_1,,p_3, p_4,p_5 },{ p_2, p_7,p_9},

{p_6,p_{10}} , {p_8}} and $\tau_{B-\{Hb\}}$(X) = { U, φ, {"p_6,p_{10}"} , { p_1, p_2,p_3, p_4,p_5,p_7,p_9"},{p_1," p_2, p_3,p_4,p_5,p_7,p_9", p_6,

$p10$ }} and μ = {$p2$ }, then $\mu B-[Hb](X)$ = {φ, U, {$p6$,$p10$},{ $p2$ }, {$p1$, $p3$,$p4$,$p5$,$p2$,$p7$, $p9$, $p6$,$p10$ } {p_2, p_6,p_{10}}{p_1 , p_2,p_3,p_4,p_5, p_7,p_9 }} and β B-[Hb](X) ={φ, U, {p_2 },{p_6,p_{10}},{p_2,"p_6,p_{10}"} {p_1, p_2,p_3, p_4,p_5,p_7,p_9"}}= β B-[fer]

CORE = {Hb lower, I hyper ferritin}.

Conclusion

We noticed from the heart that 'Hb lower "and 'I hyper ferritin "are the key factors for splenomegaly. Proper medical care and change in the behavioral pattern can prevent the risk

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حول مجموعات معينة في الفضاءات التبولوجي المايكروية على مرضى الثلاسيميا

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[2]قسم الرياضيات، كلية عاوم الحاسوب والرياضيات، جامعة تكريت، تكريت ، العراق

الملخص

تم تقديم تعريفات جديدة وهي المجموعة المفتوحة المايكرويه من النمط الفا, المجموعة المفتوحة المايكرويه المنتظمة من النمط الفا, المجموعة المفتوحة المايكرويه المنتظمة الاعتياديه من النمط الفا والقاعدة للفضاء المايكروي التوبولوجي. قد قدمت في هذا البحث مع بعض خصائصها ومن خلال المفاهيم درسنا العلاقة بين المجموعة قبل المفتوحة المايكرويه، المجموعة المنتظمة المفتوحة المايكرويه والمجموعة المفتوحة المايكرويه من النمط الفا. اخيرا

في هذا البحث بينا العوامل التي تؤثر على تضخم الطحال لمرضى التلاسيميا في مدينة الموصل مستشفى ابن الأثير.