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

Ekram A. Salh¹, Taha H. Jasim²

¹ Department of Mathematic, College of Computer Sciences and Mathematics,Mosul University, Mosul, Iraq
² Department of Mathematic College of computer sciences and mathematics, Tikrit University, Tikrit, Iraq

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Corresponding Author:
Name: Ekram A. Salh
E-mail: ekram.math@uomosul.edu.iq
            tahahameed91@gmail.com

Tel:

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 Ngr-open, Ngr α-closed, a relation among nano regular, closed sets, nano α-closed with Ngr-closed. In 2020 Saleh and Jasim [4] introduced Ngr α-open, Ngr α-closed and the relation of intersection of two Ngr α-closed, also Ngr α-continuous and Ngr α-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) ∅ ∈ τ (X)
(ii) Elements intersection of either subgroup of X. i.e if 0,1 ∈ τ (X), 1 ≤ i ≤ n → ∩ 0,1 ∈ τ (X)

Terminology. Infra-topological space has been known as the order group (X, τX): we simply say X is Infra-

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).
determined by \( U_0(X) \). Respecting to \( R \), therefore, 
\( U_0(X) = U_{X \in R}(R(x) \cap X ≠ φ) \) 
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 \( B_g(X) \), with regard to \( R \) 
and thus, \( B_g(X) = U_0(X) - L_g(X) \).

**Definition 2.3** 
Consider the universe \( U \), \( R \) and \( U \) have an even and 
\( τ_g(X) = \{U, φ, R_\geq(X), U_j(X), B_g(X)\} \) wherein 
\( X \subseteq \mathcal{U} \) satisfies the axioms below. 
1. \( U, φ \in τ_g(X) \) 
2. Elements’ union of either sub-group of \( τ_g(X) \) 
3. Elements’ crossroad of either finite sub-group of 
\( τ_g(X) \) 
So, \( U \) nano topology is known as \( τ_g(X) \) with regard to 
\( X \). The space \( (U, τ_g(X)) \) is the nano topological space. 
Factors of known as nano open groups.

**Definition 2.4** 
The nano topology space \((U, τ_g(X))\) here \( μ(X)\) \( = \{ \) 
\( \{X, \cap (\forall \mu)\} \in τ_g(X) \) and known as Micro topology 
\( N, N \) of \( τ_g(X) \) by \( μ \) wherein \( μ \notin τ_g(X) \).

**Definition 2.5** 
The micro topology space \((U, τ_g(X), μ(X))\), with 
regard to \( x \), wherein \( X \subseteq \mathcal{U} \) and whether \( A \subseteq \mathcal{U} \), so 
1- “\( A \)” set micro interior of has been determined as the 
open set union set included in \( A \) and is determined by 
Micro-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** 
Let \( (U, τ_g(X), μ(X)) \)” be a micro topology space and 
\( A \subseteq U \), then \( A \) said is to be 
Micro-pre-open set if \( A \subseteq \) Micro-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, 
regular 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 \( (U, τ_g(X), μ(X)) \) be micro topological space ,the set 
\( β = \{[φ, U, (X), (X)] \cup (\forall \cap \mu)\} \) called is basis for the 
micro topology space \( X \) on \( U \).

**Definition 3.2** 
Let \( (U, τ_g(X), μ(X)) \) be a micro topology space and 
\( A \subseteq U \), then \( A \) said is to be 
1- Micro regular open if \( A \subseteq \) Micro-int(Mic-cl(A))
2- Micro α-open if \( A \subseteq \) Micro-int(Mic-cl(Mic-int(A))

**Definition 3.3** 
consider \( (U, τ_g(X), μ(X)) \) be a micro topological space . and 
\( A \subseteq \mathcal{U} \), therefore \( A \) is known as Micro-α-
closed(respectively, 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-pre-open set ,then 
\( A = \{\) micro int \( (A) \) \} and micro int \( (A) \subseteq \) micro int \( (\) micro cl \( (\) micro int \( (A) \)) \), therefore, 
\( A \subseteq \) “micro cl (mic int (A))”, hense \( A \) is Micro-α open.

2- Let \( A \) be Micro-regular open ,then \( A = \{\) micro int \( (A) \), which is 
\( \subseteq \) “micro int (mic cl (A))”, then \( A \subseteq \) “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 \( U = \{a, b, c, d\} \) \, \( U \cap R = \{\{a\}, \{b, c\}, \{d\}\} \) and 
\( X = \{a, c\} \), 
\( τ_g(X) = \{φ, U, \{a\}, \{a, b, c\}, \{b\} \} \), 
\( μ = \) \( \{b\} \) then 
\( μ(X) = \{φ, U, \{a\}, \{a, b, c\}, \{b\}, \{a, b\} \} \). 
The mic-reg open are \( \{φ, U, \{a\}, \{a, b\}, \{a, c\}, \{a, b, d\}\} \). 
The mic-α open are \( \{φ, U, \{a\}, \{a, b\}, \{a, c\}, \{a, b, d\}\} \). 
The mic-pre-open are \( \{φ, U, \{a\}, \{a, b\}, \{a, c\}, \{a, b, d\}\} \).

**Remark 3.2** 
From the theorem 3.1 and Remark 3.1 we have the 
implications (figure 1).

**Fig. (1)**

**Definition 3.4** 
Micro topological space subgroup \( A, \) \( (U, τ_g(X), μ(X)) \) 
is known as a micro-α open if there is a micro regular 
open group \( w \), therefore \( w \subseteq A \subseteq \) Mic-cl(A).

**Example 3.2** 
Let \( U = \{a, b, c, d\} \), \( X = \{a, b\} \), “\( U \cap R = \{\{a\}, \{b, d\}, \{a, b, c\}\} \)”, 
\( τ_g(X) = \{φ, U, \{a\}, \{a, b, d\}, \{b\}\} \) 
\( μ = \) \( \{b\} \) then \( μ(X) = \{φ, U, \{a\}, \{a, b, d\}, \{b\}\} \)
\( μ = \) \( \{b\} \) and \( \) \( \{\{a\}, \{a, b\}\}\). And 
\( \) \( \{\{a\}, \{a, b\}\}\). And 
\( \) \( \{\{a\}, \{a, b\}\}\).

**Definition 3.5** 
Topological micro space subgroup \( A, \) \( (U, (X), (X)) \) is 
known Micro-grα closed if Mic-cl(Mic-int(A)) \( \subseteq w \), 
anytime \( A \subseteq w \) and \( w \) is smallest mic-grα open 
containing \( A \).

**Theorem 3.2**
(i) Each micro-locked set as Micro-grα closed
(ii) Each micro regular-locked group as Micro-grα closed.
(iii) Each micro-α locked group is Micro-grα closed.

**Remark 3.3** 
Theorem 3.2 converse couldn’t not be right as the 
next example shows.

**Example 3.3** 
Let’s “\( U = \{a, b, c, d\}, U \cap R = \{\{a\}, \{b, d\}, \{a, b, d\}\}\)” 
\( L = \{a, b\} \subseteq U \), then 
\( τ_g(X) = \{U, φ, \{a\}, \{a, b, d\}, \{b\}\} \) by \( μ = \{b\} \), 
then 
The micro open groups = \( \{φ, U, \{a\}, \{a, b, d\}, \{b\}\} \) 
\( \{a, b\}\)
The micro locked groups = \{U, \varphi, \{b, c, d\}, \{c\}, \{a, c\}, \{a, c, d\}, \{c, d\}\}

The micro regular locked groups = \{\varphi, \{b, c, d\}, \{a, c\} \}

The Mic-\alpha closed groups = \{\varphi, \{b, c, d\}, \{a, c\}, \{a, c, d\}, \{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)

**Theorem 3.3**

The intersection of two Mic-gr\(\alpha\)-locked groups is also a Mic-gr\(\alpha\) closed set.

**Proof**

Consider A and B as two Mic-gr\(\alpha\)-locked group in \((U, \tau_{\beta}(X), \mu_{\beta}(X))\). Let Mic-int(Mic-cl(A)) \subseteq w, Mic-int(Mic-cl(B)) \subseteq w, \forall w, B \subseteq w and w is smallest mic-\(\alpha\) open containing A. Then we have, ANB \subseteq w. Now "Mic-int(Mic-cl(ANB))" = "Mic-int(Mic-cl(A)) \cap Mic-int(Mic-cl(B))" \subseteq w. Thus ANB is a Mic-gr\(\alpha\)-locked group in U.

**Theorem 3.5**

Two Mic-gr\(\alpha\)-locked groups union is should not Mic-gr\(\alpha\) – 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\}, \{a, b\}}. then 
\(\tau_{\beta}(X) = \{\varphi, U, \{a\}, \{b\}, \{a, b\}\}\), by \(\mu = \{b\}\), then \(\mu_{\beta}(X) = \{\varphi, X \{a\}, \{a, b\}, \{b\}, \{a, b\}\}\).

Mic-gr\(\alpha\)-closed sets = \{\varphi, U, \{a\}, \{c\}, \{a, c\}, \{a, d\}, \{a, c, d\}\}.

Here \{a\} \cup \{b\} = \{a, b\} be not Mic-gr\(\alpha\)-closed.

**Theorem 3.6**

Whether A be Mic-gr\(\alpha\)-closed subset of \((U, \tau_{\beta}(X), \mu_{\beta}(X))\) therefere \(A \subseteq B \subseteq \text{Mic cl(Mic int}(A))\), therefere B is Mic-gr\(\alpha\)-closed set in \((U, \tau_{\beta}(X), \mu_{\beta}(X))\).

**Proof**

Consider A as a Mic-gr\(\alpha\)-locked subset of \((U, \tau_{\beta}(X), \mu_{\beta}(X))\) \(A = B \subseteq \text{Mic cl(Mic int}(A))\). Let \(B \subseteq w\) be smallest Mic-\(\alpha\) open set containing A therefore, \(B \subseteq w\). As A is Mic-gr\(\alpha\)-locked, Mic cl(Mic int(A)) \subseteq Mic cl(Mic int(B)) therefore \(B \subseteq w\). This implies that B is Mic-gr\(\alpha\)-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.
Here U = \{p_1, p_2, p_3, p_4, p_5, p_6, p_7, p_8, p_9, p_{10}\}, the set of patients and \( A = \{\text{Hb lower}, \text{Hormones}, \text{I hyper ferritin}\} \). It is split into two classes, \( B = \{\text{Hb, Hor,fer}\} \) and \( C = \{\text{splenomegaly}\} \). The group of Equivalence types, \( UB\) corresponding to \( B \) is given by the partition \( UB = \{(p_1, p_2, p_3, p_4, p_5, p_6, p_7, p_8, p_9, p_{10})\} \).

Case 1 (Patients with splenomegaly)

Let \( X = \{p_1, p_2, p_3, p_4, p_5, p_6\} \), the set of patient with splenomegaly. Then, \( \tau_{B|\phi}(X) = \{U, \phi, \{p_1, p_2, p_3, p_4, p_5, p_6\}\} \) and hence \( \tau_{B|\phi}(X) = \{U, \phi, \{p_1, p_2, p_3, p_4, p_5, p_6\}\} \).

Phase 1: The attribute \( \tau_{B|\phi}(X) \) is removed from \( A \) by the rule \( \tau_{B|\phi}(X) \rightarrow \{U, \phi, \{p_1, p_2, p_3, p_4, p_5, p_6\}\} \).

\( \{p_1, p_2, p_3, p_4, p_5, p_6\} \), \( \{p_{10}\} \) and hence \( \tau_{B|\phi}(X) = \{U, \phi, \{p_1, p_2, p_3, p_4, p_5, p_6\}\} \).

Phase 2: The attribute \( \tau_{B|\phi}(X) \) is removed from \( A \) by the rule \( \tau_{B|\phi}(X) \rightarrow \{U, \phi, \{p_1, p_2, p_3, p_4, p_5, p_6\}\} \).

Case 2 (Patients not with splenomegaly)

Let \( X = \{p_1, p_2, p_3, p_4, p_5, p_{10}\} \), the set of patients without splenomegaly. Then, \( \tau_{B|\phi}(X) = \{U, \phi, \{p_1, p_2, p_3, p_4, p_5, p_{10}\}\} \).

Phase 1: The attribute \( \tau_{B|\phi}(X) \) is removed from \( A \) by the rule \( \tau_{B|\phi}(X) \rightarrow \{U, \phi, \{p_1, p_2, p_3, p_4, p_5, p_{10}\}\} \).

Phase 2: The attribute \( \tau_{B|\phi}(X) \) is removed from \( A \) by the rule \( \tau_{B|\phi}(X) \rightarrow \{U, \phi, \{p_1, p_2, p_3, p_4, p_5, p_{10}\}\} \).

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.
حوال مجموعات معينة في الفضاءات التبولوجي المايكروية على مرضى التلاسيميا

أكرم عبد القادر صالح ١، طه حميد جاسم ٢

قسم الرياضيات، كلية علوم الحاسوب والرياضيات، جامعة الموصل، الموصل، العراق

قسم الرياضيات، كلية علوم الحاسوب والرياضيات، جامعة تكريت، تكريت، العراق

ملخص

تم تقديم تعريفات جديدة وهي المجموعة المفتوحة المايكروية من النمط الفا، المجموعة المفتوحة المايكروية المنتظمة من النمط الفا، المجموعة المفتوحة المايكروية المنتظمة الاعتيادية من النمط الفا والقاعدة للفضاء المايكروي التبولوجي. قد قدمت في هذا البحث مع بعض خصائصها ومن خلال المفاهيم درسنا العلاقة بين المجموعة قبل المفتوحة المايكروية، المجموعة المنتظمة المفتوحة المايكروية والمجموعة المفتوحة المايكروية من النمط الفا. اخيراً،

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

References


